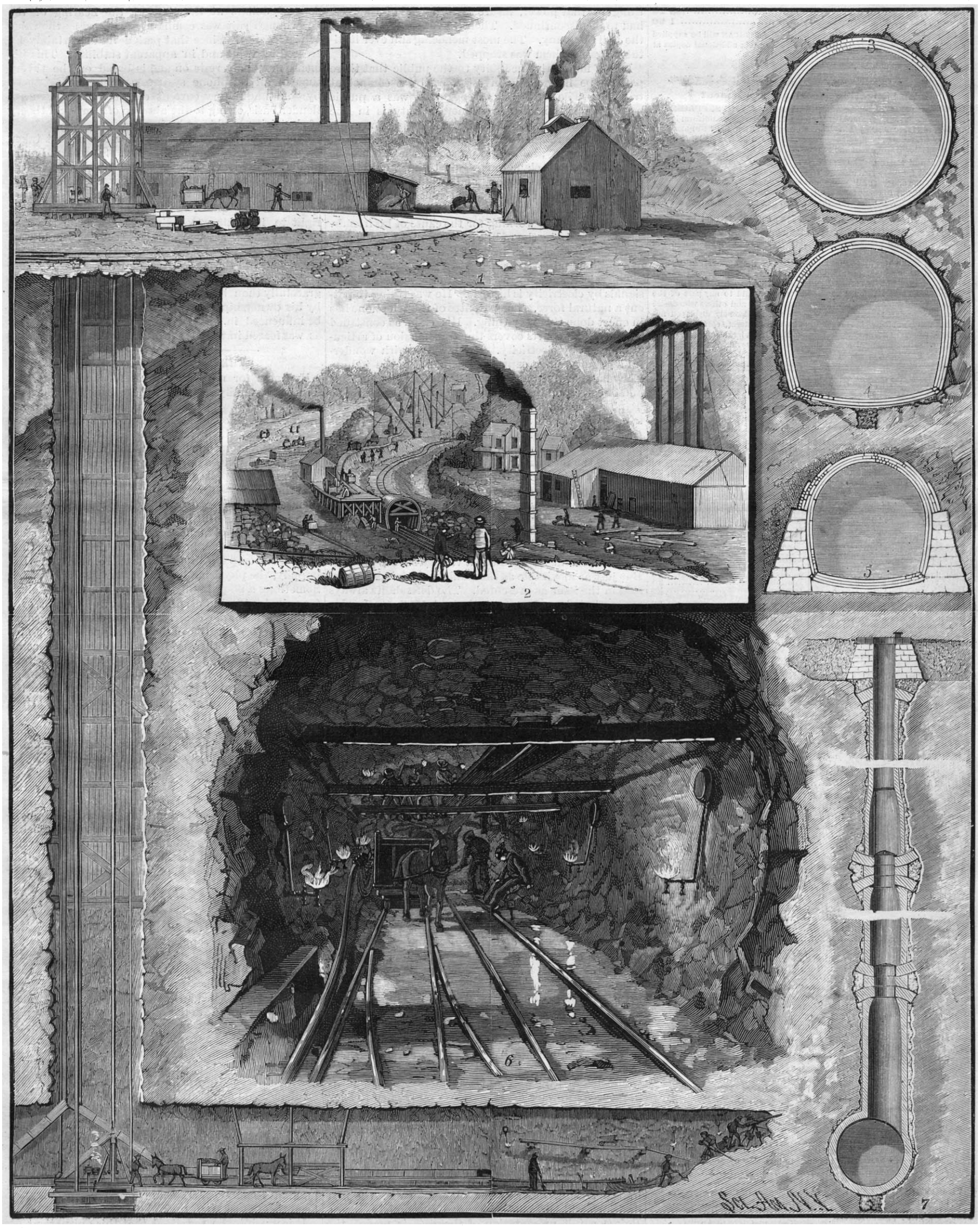
SCIENTIFIC AMERICAN

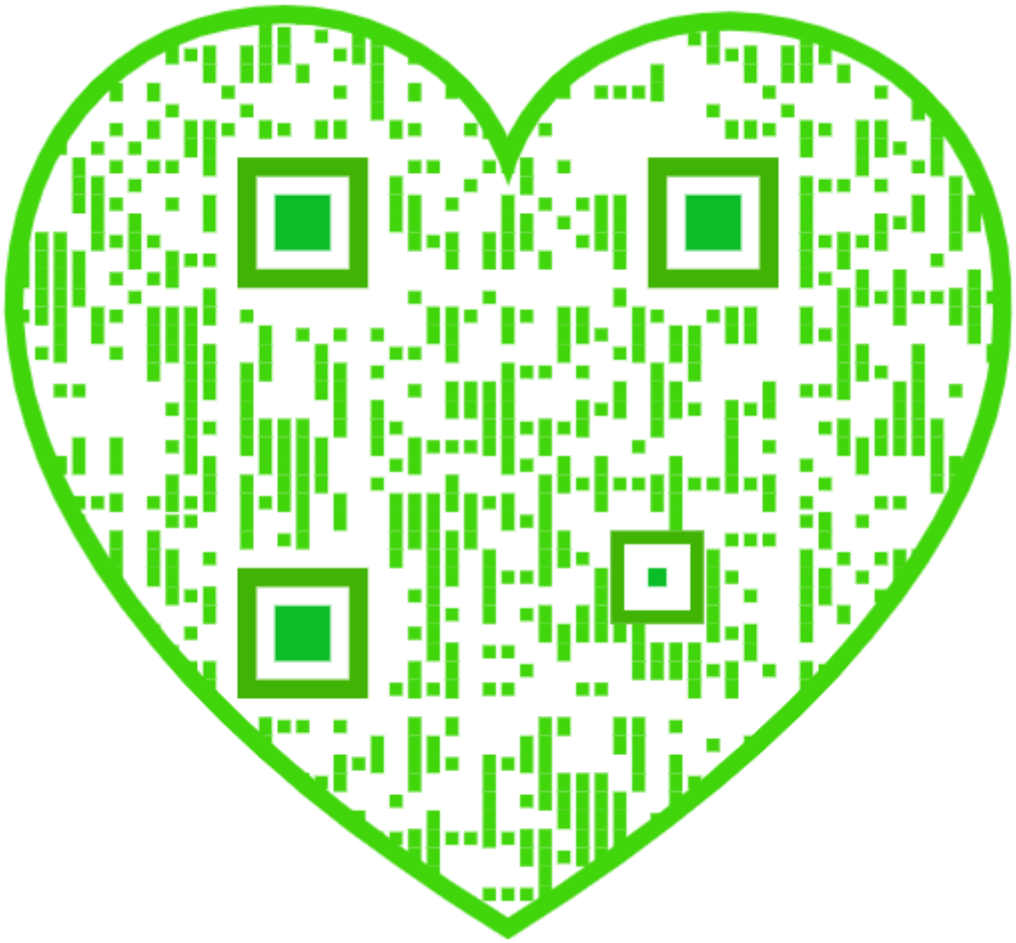
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LIII.--No. 19. [NEW SERIES.] NEW YORK, NOVEMBER 7, 1885. [$3.20 per Annum. [POSTAGE PREPAID.]



THE NEW AQUEDUCT TUNNEL FOR THE CITY OF NEW YORK.—[See page 293.]



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, NOVEMBER 7, 1885.

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GOVERNMENT INVESTIGATION OF THE BELL PATENTS.

The Bell telephone patents seem to be peculiarly favored by fortune. After adverse action by the circuit courts, their opponents sought the aid of the government, endeavoring to make it assume the role of public prosecutor, so as to decide the validity of the patents finally on their merits. The Attorney-General's department was manifestly the proper one to prosecute the case. But on reference to him, it was found that he owned some outside telephone stock, was therefore interested in the defeat of the Bell patents, and so could not properly act as prosecuting officer. Hence a suit that had been begun by his subordinates, and which was started on such a basis as would, if anything has that power, insure the full trial of the case, had to be discontinued. Their fortune did not desert the Bell Company. The most menacing suit ever instituted against them was stopped.

It is of imperative necessity to the public that these patents be impartially investigated by a competent tribunal. The suit just discontinued was a public need. What the Attorney-General's duty is in the matter is hard to say. It would seem asking too much to suggest his resignation. If, while owning stock in an adverse company, he was to prosecute the suit, public opinion would be clamorous against him, would make him waver in his action, and would unquestionably bias the mind of the court strongly against him. He might sell his stock, but even if he did so, he would still appear as one working for the cause of his friends. The ownership by the public prosecutor of a few shares of telephone stock has become lifted into the dignity of a national misfortune.

The rejection of Morse's claims to the transmission of signals by electricity is historic. He was trying to patent a natural force. The patentee of the telephone has in effect done this very thing. His claim as construed by the circuit courts covers the transmission of articulate speech by electricity. His lawyers, with wonderful ingenuity, have captured the minds of the judges. They have evolved a theory of an undulatory current, and of corresponding movements of the two telephone diaphragms, that they can stretch to cover any electric telephone. A point of such abstract theory as this is made one of the central features of their defense. The probability that there is no such thing as an electric current, the incapacity of an induction coil for generating a continuous current in any sense, the probable inoperativeness of any undulatory feature that may be accidentally present in telephone currents, are all lost sight of, or cleverly evaded, and the fiction of an undulatory current is kept up. A number of suits have been decided on final hearing by the circuit courts, and always with the same result, a victory for the patents. But just as inevitable as the result was an incompleteness in the issue as presented. The defendants always made admission of some of the points of attack. Infringement was admitted in one case, claims of other inventors were left out in others. The question of validity never yet came to trial upon its merits. At last, in the western district of Pennsylvania, such a case came up on motion for preliminary injunction. Every effort was made to meet the motion by a full defense. All the points that could be raised against the Bell patents were to be used. Even a series of Reis and other telephones were prepared for exhibition, and personal auricular trial by the court to prove anticipation.

The case was opened by the patentee's counsel, in an elaborate address, lasting several days. After the opening had been only commenced by the defendants, the judge announced that he should in any case be guided in his decision by what his brethren of the circuit courts had already done, and should grant the injunction. This action was taken in the face of the fact that a new set of issues, because a complete set, were open for the judge's consideration. Of course in the normal course of things the suit will come eventually to a final hearing, but the treatment of the elaborate and full resistance to a preliminary injunction is a good illustration of the remarkable prestige held by the owners of the Bell patents. From the character of the counsel and capitalists engaged and interested in this suit, much may yet be hoped for from it

Distinct allegations of fraud in the granting of the Bell patents bring them within the province of action of the Attorney-General. He could have tried the case in the circuit and eventually in the Supreme Courts, as no one else could. The action would come from such a new quarter that the circuit court judges would be to a greater or less extent free from the influence of former decisions. A way seemed to have been found in which to try the case *de novo*, upon its merits, unaffected by decisions in other cases. Unfortunately, it had to be abandoned.

The natural tendency would be to look to the Supreme Court for the remedy. The Bell patents have never appeared before that tribunal. When they do, in the natural order of the different suits, the first decisions will be rendered upon incomplete issues. Before a full presentation of the case is made, the Bell Company in every probability will have secured several Supreme Court decisions. Each of such decisions will make the ground of attack doubly hard for the next suitor. Thus it appears that there is little chance for a decision that will be satisfactory, because a complete one, for many months; and when the time for such action arrives, the court will quite probably have behind it and be guided by a series of decisions in the patent's favor. All this shows how well the case has been engineered by the eminent counsel retained by the Bell Company. The patent, in itself, is far from being the basis of the prosperity of its owners. It has not merit enough in it to give it that position. But a combination of great business with great legal talent has made it the cornerstone for an unprecedented structure. One hundred millions of dollars at the time of the hearing of the Drawbaugh suit was commonly assigned as the value of the interest. Since that period it has certainly increased in value and in apparent stability. This immense monopoly rests on and is based on the theory that in all telephone systems speech is reproduced by "an undulatory current of electricity." A more slender basis, owing to the absence of a rational theory of electricity, could not be imagined.

The Department of the Interior has at last taken cognizance of the state of affairs. Secretary Lamar and Commissioner Montgomery are to have the counsel and representatives of several telephone companies appear before them for the consideration of the following questions: 1. Has the government a right to institute proceedings to set aside the Bell patents? and 2. If so, are the facts such as would warrant the bringing of such an action? If the questions are decided in the affirmative, and the Attorney-General is requested to prosecute, he will do it more gracefully than before, bnt still will be overshadowed by his ownership of telephone stock. The courts will be influenced in favor of the Bell patents by it, just as was feared in the discontinued suits.

"THE DOLLAR MEDICAL SHOP."

Expenses for medical services form an important item in the family account of the artisan and the workingman. A growing family has many aches and ailments, which, not being understood, seem the more serious—hence the physician and his bill.

There is reason to believe that not once in five times when the physician is called to attend one of these families is his presence required. A simple remedy that the more intelligent would quickly have bethought themselves of is prescribed by the physician, and the pain is stopped. But his bill goes on. The items increase and multiply, and his services, like good seeds sown in the ground, bring forth their fruits in their season, his crop ripening at the end of the year. Unhappily, the physician has no regular system of prices. Sometimes a poor family is charged only two dollars for a single visit, but usually three, and operations, even of the most simple description, are often charged for according to what the patient is supposed to be able to pay. The apothecary may also be regarded as an unknown quantity. The wind, we are told, is tempered to the shorn lamb, but the apothecary knows no such merciful rule. He gets what he can, and in the getting has little regard apparently to what the article costs him. Those familiar with the market price of drugs and simples have often been pained and surprised to see him charge sixty cents and even a dollar for what could scarcely have cost him so much as a shilling.

This indefinite system of charge is a serious matter to the workingman with a family. If a rash breaks out on the baby, it costs him three dollars for a physician, and perhaps sixty or eighty cents for medicine; and if Mary Jane be suddenly taken with chills, several visits and prescriptions are presumably required, which between physician and druggist mayhap cost the poor man a week's earnings.

Attempts have been made to protect the workingman with a family from these impositions. Some of the workingmen's clubs connected with the churches employ skillful and reputable physicians, who give their services to members at nominal prices. The most successful attempt thus far to protect poor families is perhaps that of the directors of the New York Hospital, who have established an out-patient dispensary, where, for a fee of only one dollar a month, a poor family may have twelve consultations during the same period; the prescriptions that are made up costing from ten to twenty cents extra. The physicians employed at the hospital, where all consultations take place, are, in all cases, the most skillful practitioners in the city, the medicines and drugs are the best, and the prescriptions carefully compounded.

Experience has shown that this system is much to be preferred to that of the public dispensary, because the dollar a month fee keeps away the malingerer and the tramp, and, better still, does much to remove the feeling of alms-taking, which it has been found is so repugnant to many worthy and deserving people as to keep them away from the public dispensary.

It is much to be regretted that this out-patient department of the New York Hospital has excited the open hostility among a certain class of the medical

profession, who, forgetting the advantages it offers to the poor, seem inclined to look only to the fees which are lost to the physician.

In a recent editorial in the *Medical Record* on "The Dollar Medical Shop," a writer says: "As is learned from the annual report of the year 1884 (of the New York Hospital), 5,169 persons availed themselves of this imposition during that year, and the total number of visits was 27,565. . . . *No encouragement should be given to this class, who seek to evade their dues to physicians.*"

The italics are ours.

This is assuredly an extraordinary view of the matter. Is there any class of the community which is under obligation to pay over a certain amount in "dues" to physicians? And is it an injustice to these physicians if a certain number of possible patients combine together to protect themselves against extortion and malpractice? Certainly not.

If the writer of this article in the *Record* had shown that the subscribers to this dispensary were not properly treated and could not be properly treated under the conditions, then surely he would have done something to make out a case. But as it is, he argues only for dollars and cents, and against the interests of the poor patient. Continuing, he says: "If the present abuse be not soon checked, it may be that each physician will have his own dispensary, that is, treat people free at his own office during certain hours. In that case, the dispensaries would soon find their occupation gone, and their spheres of usefulness properly narrowed."

Now, if physicians should treat the poor free at certain hours as suggested, they would be doing no more than many eminent French physicians like Ricard and German physicians like Trubmann have done before them; and should such a condition of things come to pass, and the public dispensary, as the writer prophesies, find its occupation gone, the projectors of these admirable institutions will at least have the satisfaction of knowing that they brought about a very desirable change in the treatment of the poor sick.

The Soil as a Filter.

The conclusions from experiments made by the National Board of Health of New York, and conducted by Raphael Pumpelly, corroborate the opinion of every sanitarian in this country, that though natural soil is an excellent filter for impure air that may pass through it, it is a poor filter for infected water. The experimenters say: "From these results it appears that sand interposes absolutely no barrier between wells and the bacterial infection from cesspools, cemeteries, etc., lying even at great distances in the lower wet stratum of sand. And it appears probable that a dry gravel or possibly a dry very coarse sand interposes no barrier to the free entrance into houses built upon them of these organisms, which swarm in the ground air around leaky drains," etc. Other experiments have shown that ground air will take up infectious germs from water that is disturbed.

The Ticking of the Clock.

Slight though the ticking of a clock may be, says a writer, its sudden cessation has a wonderful influence upon the inmates of a room in which the time keeper is located. A dim realization of something wrong steals over the senses—a feeling as if something of value had been lost, or a friend had gone away perhaps never to return, or as if some of the children were sick, until suddenly one looks up and exclaims, "Why, the clock's stopped!" And immediately the ill-defined forebodings dissipate, the little shadow of gloom melts away, and as the winding-up process is completed and the cheery ticking recommences, the family circle regains its wonted buoyancy of spirits, and the members wonder what it was that made them feel so gloomy a few moments before.

Improvement of the Ohio River.

The Davis Island Dam was formally opened on October 8. This dam, on the Ohio, six miles below Pittsburg, Pa., designed to maintain a navigable stage of water at that city the year round, was begun August 18, 1878, and since then, with many interruptions and delays, the national government has spent nearly $1,000,000 on the structure. The dam's distinctive feature is its movability. It is in reality 300 little dams, each so hinged that it can lie prone upon the river bed. This line of movable dams, or "wickets," extends the entire distance across the river, 1,223 feet. Of this distance, 559 feet only is the navigable pass or pathway for all craft when the lock is not used. The rest of the dam is designated as "weirs," of which there are three, divided by solid piers of masonry. To raise the wickets of the navigable pass, a "maneuvering boat" is used; to raise the "weir" wickets, a "surface bridge" is called into play.

Like the wickets, this bridge lies upon the bed of the river when not in use, and is raised and joined section by section. To raise the wickets and tilt them into position, where they are retained by a prop, calls into play an ingenious device, the Pasqueau "hurter." A deft pull upon the prop dislodges it, and permits the wicket to recline upon the bed wrested from the river. Between each wicket is a space of an inch or two, which can be batted if desired, but which will probably be left open to permit the passage of surplus water.

The monster gates of the lock are closed by force generated in a turbine wheel fed by water stored in huge tanks. Each gate rolls upon its track, and when in position they form the upper and lower extremes of a lock 110 feet wide and 600 feet long; a space sufficient to accommodate a tow boat and average tow of canal boats and barges. To fill the lock requires but four minutes' time; to empty it, the same.

The great dam is experimental in that, should its success be assured, others will follow, and a series of pools will render the Ohio steadily navigable, as has been the case on the Monongahela.

FROM experiments performed by Prof. Bauschinger, of Munich, it was found that of all the materials used in columns for supporting portions of buildings, cast iron and cement concrete best endured the test of great heat, as in fires and sudden cooling with water. Wrought iron columns failed much more quickly. Brick pillars showed great resistance, but granite, limestone, and sandstone were not fireproof.

NIGHT SKY—OCTOBER AND NOVEMBER.

BY RICHARD A. PROCTOR.

The Dipper lies low, the pointers a little east of north. Between the pointers and Pole Star lies the tip of the Dragon's Tail. Sweeping around the Little Bear (*Ursa Minor*) we find the stars of the Dragon (*Draco*) curving back by the star δ to the Dragon's Head with the two bright eyes, γ and β. Above is the inconspicuous constellation Cepheus; and somewhat higher, the stars of Cassiopeia, α and β, marking the top rail of the Seated Lady's Chair.

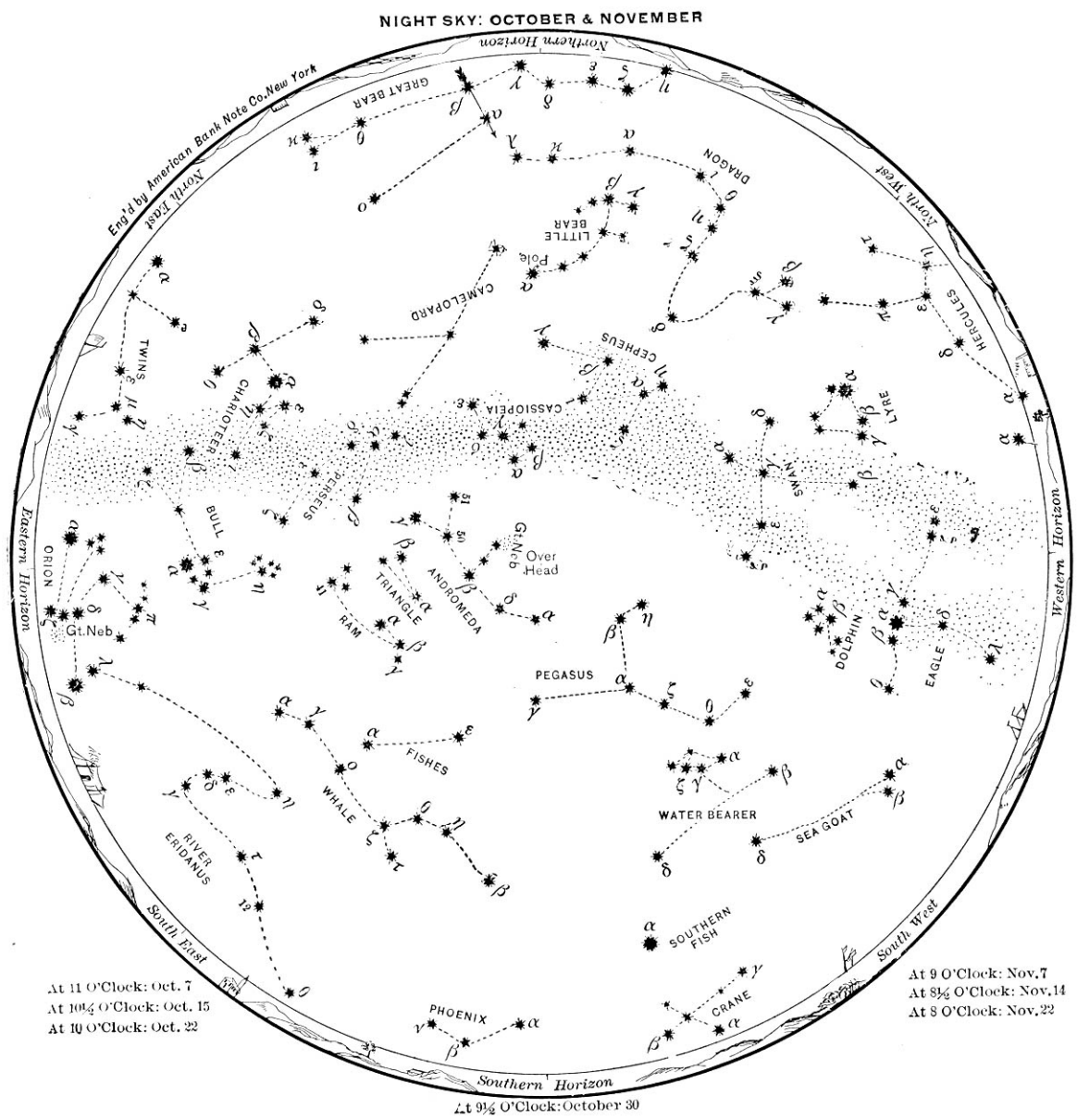
Low down in the northwest, Hercules is setting. Above is the Lyre, with the bright steel blue Vega; and above that the stars of the Swan (*Cygnus*), which has sometimes been called the Northern Cross.

Nearly due west we find the Eagle (*Aquila*), ζ and ε marking its tail, θ the head. Above the Eagle is the pretty little constellation *Delphinus*, the Dolphin.

In the southwest, rather low, is the Sea Goat (*Capricornus*); above and to the south of him the Water Bearer (*Aquarius*), with his pitcher, marked by the stars, α, γ, and ζ. The head of the Winged Horse, *Pegasus*, now upside down (in fact, he is seldom otherwise), is just above this group. The "Square of Pegasus" will be noticed high up, due south. The star α, of Andromeda, one of the corners of this square, used to be also called δ of Pegasus.

Much attention need not be directed to the lowly Phœnix, low in the southern horizon. The River *Eridanus* is coming well into view; and the great Sea Monster (*Cetus*) now shows finely, his head at at α and γ, his paddles ζ and τ. The fishes (*Pisces*) are above, the Ram (*Aries*) above them and eastward, lying toward the southeast, then the Triangle (*Triangula*, or the Triangles, according to modern maps) and the Chained Lady, *Andromeda*, too nearly overhead to be very pleasantly observed. The great nebula in which the new star recently appeared is near the point overhead.

The grand giant Orion is rising in the east; above him the Bull (*Taurus*) with the Pleiades. Low down in the northeast the Twins (*Gemini*) are rising; above is the Charioteer (*Auriga*), and above him the Rescuing Knight (*Perseus*), "of fair haired Danae born." The Camelopard is hardly worth noticing, except as marking a barren region of the heavens.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four-pointed; fifth magnitude (very few), three-pointed, counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

Preserving Eggs.

Now is the time the egg preserver may get in his work. In many towns, both East and West, shrewd men are packing eggs by the thousands at a cost of less than one cent each. Next winter they will sell at two cents each, when fresh eggs are 50 per cent higher. Eggs packed and treated as follows can be kept three months, and seem and look like fresh eggs:

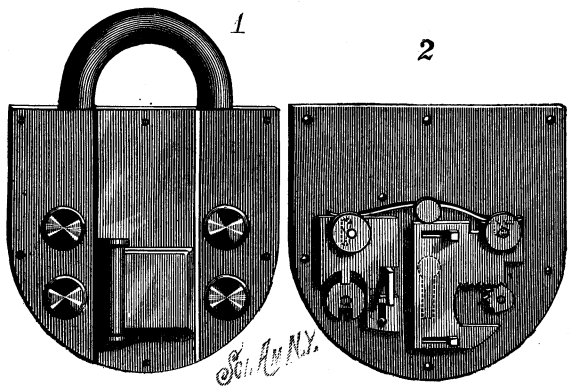
Take a common box, such as is used for packing canned tomatoes; upon a two inch layer of fresh, clean oats place the eggs, large end down, and leave space of at least an inch between the eggs; cover with a layer of oats and then place another layer of eggs as before, until the box is nearly full; fill it with oats, packing the grain in neatly and screw on the top; place your box in a cool cellar, and turn it upside down every other day. If strictly fresh eggs are used, and the turning is attended to as directed, few persons will know them from fresh eggs, and they will certainly be much superior to limed or pickled eggs.—*National Stockman.*

IN the Smithsonian Institution, at Washington, is the small nugget of gold, a little larger than a pea, that first met the eyes of James Marshall in the sawmill raceway at Sacramento, and was the beginning of those discoveries in California that have added nearly $1,500,000,000 in gold to the world's stock of the precious metals.

* For further details about the various constellations, the reader is referred to the author's "Easy Star Lessons."

AN IMPROVED KEYHOLE GUARD.

An ingeniously contrived keyhole guard, recently patented by Mr. Joseph Krejci, of Armstrong, Neb., affords a double protection against interference with the lock. In the engraving, Fig. 1 shows the outside of a padlock to which the device has been applied, and Fig. 2 the interior mechanism which operates the guards. A metal door over the keyhole, and two buttons on each side of the door, are the only parts visible on the outside. After turning the key in the lock, and removing it from the keyhole, the outside door is closed, and a hook on its inner side near the free end passes through a slot in the front face of the padlock. The upper right hand button is raised to bring an inner plate under this hook, and the lower right hand button is then turned to the right to bring the shallow



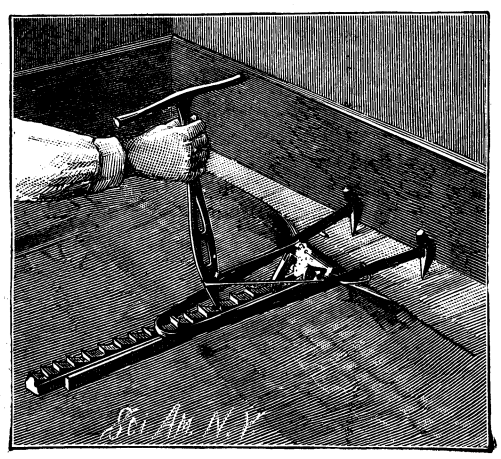
KREJCI'S IMPROVED KEYHOLE GUARD.

notch on its inner disk under a downwardly projecting lug on the locking plate. When notch and lug are opposite each other, the plate is forced down by a spring above it, and is locked in place by the engagement of the lug and notch.

The second guard is a horizontally movable plate, which may be brought over the inside of the keyhole. For this purpose, the upper left hand button is raised to disengage its inwardly projecting pin from the central notch in the top of the plate, and the lower left hand button is then turned to the right, to cause its toothed disk to engage the teeth formed in the lower edge of a recess in the guard plate, as shown in the second figure. When the plate has been moved far enough to cover the keyhole, a spring forces the pin on the upper button into a second notch in the top of the guard plate, and thus locks it in place. When it is desired to unfasten the padlock, the upper buttons are raised, as before, and the lower buttons are turned about a half revolution, but in a reverse direction. The outer door can then be opened, and as the inner guard plate has already been moved to one side, the key can readily be inserted. Although this invention is shown applied to padlocks, it is evident that it is equally applicable to other locks.

AN IMPROVED CARPET STRETCHER.

The illustration herewith plainly shows the operation of a simple and effective device for lessening the labor of laying carpets. A grooved bar is placed on the floor, and in the groove is a sliding rack, pivoted at its front end in the grooved bar. A U-shaped frame, having heads at each end, with their lower ends pointed, is held above the sliding rack by a V-shaped wire or fulcrum rod held between the open and closed ends of the frame, and this fulcrum rod is connected with the upright handle or lever. The grooved bar has at its



TAYLOR'S CARPET STRETCHER.

front end a flattened part, over which the edge of the carpet is lapped, where it is clamped by the pulling back of the lever; moving back the lever further stretches the carpet toward the wall, and the stretcher is locked in place by pressing the frame down to engage its crosspiece with the teeth of the rack, the outer ends being held by the points of the heads driven into the floor, at the baseboards. The handle, shown upright, is a hammer as well as a lever, being made in suitable tack hammer form.

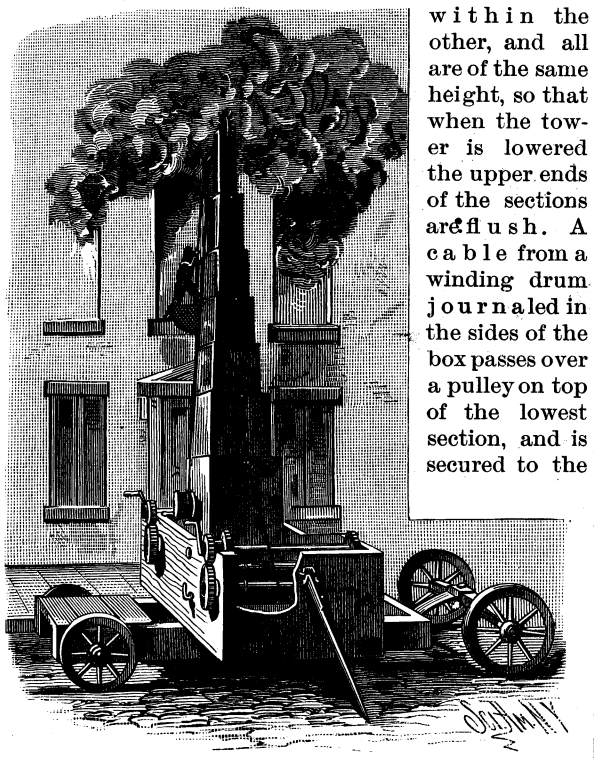
This invention has been patented by Mr. John J. Taylor, 2d, and the stretchers are manufactured by Messrs. Pickett & Rogers, of Warren, Pa.

Drying Tomatoes.

In Italy an extensive business is carried on in drying tomatoes to use during those portions of the year when fresh fruit cannot be obtained. According to the *Rural Record*, tomatoes are grown, for the most part, between rows of grape vines. Sometimes the tomatoes are trained on the lower bars of the trellis to which the vines are attached. The tomatoes are allowed to remain on the branches until they are quite ripe; they are then picked and pressed in bags made of coarse cloth, which allows the pulp to pass through, but which retains the seeds and skins. The pulp is then thinly spread out on cloth, boards, or in shallow dishes, and exposed to the sun to dry. When it has become quite dry, it is broken up fine, or ground, and put into boxes or bags and sent to market. A large part of it is used for making soups, but a considerable portion is employed as we do tomatoes when preserved in tin or other cans. It is soaked for a few hours in warm water, and then cooked in the ordinary manner. There is a great prejudice against canned tomatoes. many being unwholesome. The acid juice which they contain unites with the solder of the tin cans, and forms a disagreeable compound.—*The Garden.*

FIRE ESCAPE.

The object of the invention herewith illustrated is to provide a fire escape which can easily be transported to the fire, elevated to reach to the tops of the highest buildings, and inclined toward or from the buildings as required. Arranged to turn on the wagon platform is a box, and on one edge of the top of the base the lower edge of the bottom section of the telescopic tower is hinged. The tower consists of several sections; one section slides within the other, and all are of the same height, so that when the tower is lowered the upper ends of the sections are flush. A cable from a winding drum journaled in the sides of the box passes over a pulley on top of the lowest section, and is secured to the



SANDBERG & AKESON'S FIRE ESCAPE.

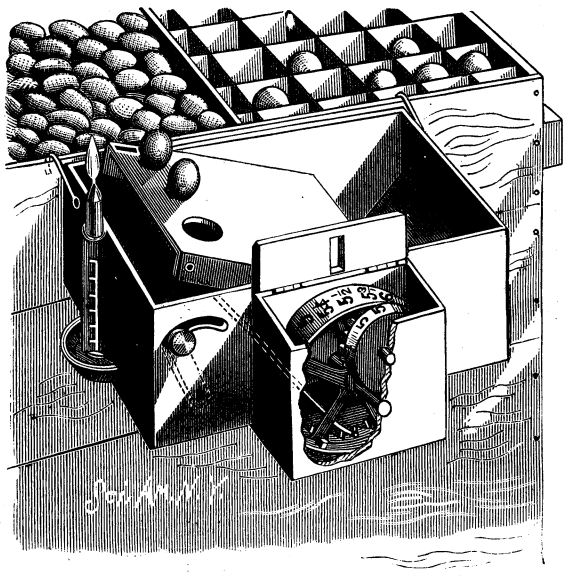
lower part of the second section. On the opposite side of the tower a cable is secured to the upper part of the second section, and passed over a pulley on the top of the third section, and fastened to the lower part of the third section. Cables are similarly arranged on the remaining sections. In the forked end of the upper section is journaled a pulley having spikes on its rim. On one side of this section is a pulley over which passes a rope, from one end of which is suspended a strong wire basket having one side flattened, so that it can slide up the side of a building. The other end of the rope is wound upon a drum on the side of the bottom section. The hoisting rope is placed at the hinged side of the tower; on the other side a cable is secured to the bottom section at the top and bottom, and is passed a number of times around two winding drums.

The apparatus is simple to operate; the truck is placed in front of and parallel with the building, when the box carrying the tower is turned until the side pieces are at right angles to the building. The tower is then raised by winding the hoisting cable upon the drum; the cable pulls upward the second section, which in turn pulls up the third and so on, all the sections being raised at the same time. If desired, the tower can be swung over until the spiked pulley rests against the building; to incline the tower, the drums are so revolved as to wind that part of the rope connected with the bottom of the lower section and to unwind that part connected with the top. Before raising the tower the lower part is securely braced. The entire apparatus can be made of wood or metal.

This invention has been patented by Messrs. J. E. Sandberg and Magnus Akeson, of Butte City, Montana Ter.

EGG REGISTER AND TESTER.

The object of this invention is to provide a device by means of which the dealer may, at a glance, separate the bad from the good eggs; the device also automatically registers the number tested. In the engraving it is shown attached to an ordinary egg case. To use the tester, three eggs—that is, a quarter dozen—are placed in the holes in the pivoted top, which swings down to a horizontal position, thereby causing an arm



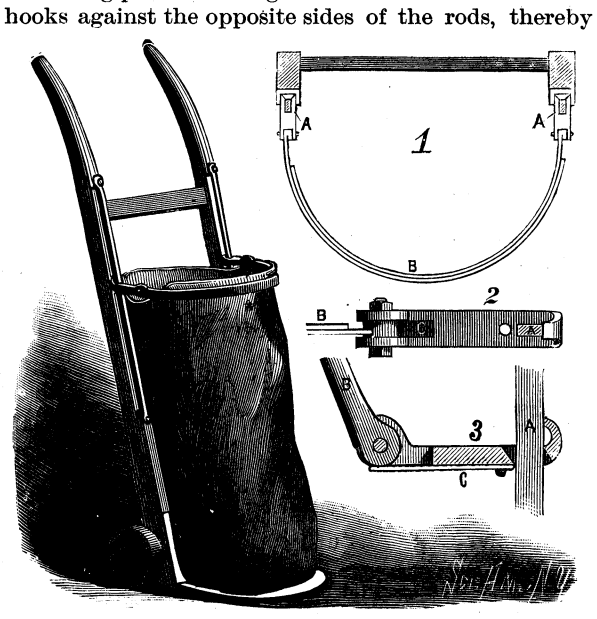
MARTI'S EGG REGISTER AND TESTER.

to move the large numbered wheel a distance of one tooth. The candle illuminates the eggs, the figures of which are reflected in an inclined mirror in the opposite end of the tester, and can be seen distinctly. The good and bad eggs can be readily distinguished. When the large wheel has made one revolution, the smaller one is moved one tooth. By means of the knob on the side, the register may be thrown out of gear.

This invention has been patented by Mr. Casper Marti, of 511 Washington Av. South, Minneapolis, Minn.

BAG HOLDER FOR TRUCKS

This bag-holding attachment for trucks serves to hold the bag while it is being filled and transported. The side bars of the truck have recesses on their front edges, over which are secured rods, A. On each rod is a sliding clip, Fig. 2, formed with one forked and one hooked end. At the hook the clip has a slot, the ends of which are beveled, as shown in Fig. 3, and between the jaws of the forked end is pivoted a semicircular steel bow, B. When the holder is not in use, the clips are moved to the upper ends of the rod, and the bows folded up between the handles. When the holder is to be used, the clips are moved down, according to the length of the bag, and the bows are swung down to project from the front of the truck. The mouth of the bag is then clamped between the bows by raising one of them, passing a portion of the upper edge of the bag around the lower one, and then lowering the raised bow, when the bag will be firmly clamped. The weight of the bag presses the edges of the beveled slot and the hooks against the opposite sides of the rods, thereby



YOTHERS' BAG HOLDER FOR TRUCKS.

holding the clips and bows in place. Springs, C, bearing against the eyes formed in the ends of the bows hold them in any position; and shoulders formed on the ends of the bows, by striking the ends of the springs, prevent the bows from swinging down too far.

This invention has been patented by Messrs. Walter S. and Joseph W. Yothers, of Karthaus, Pa.; further particulars can be obtained from the former.

A COURSE in sanitary engineering has been created in the School of Mines, Columbia College. The course will occupy four years, and the graduating students will receive the degree of Sanitary Engineer.

SOME OLD WARWICK HOUSES.

The two sketches which we produce from the pencil of Mr. Prince, of Manchester, afford a good idea of the Midland timber framed house, though they have not the ornate character of those within the walls of the old borough. The tree depicted in front of the old inn in Coton is one of the many trees in the neighborhood which is reported to mark the "center of England." The house in Mill Street, just under the Castle Tower, is larger and more pretentious. In its rear is a court-

SUGGESTIONS IN ARCHITECTURE.—OLD WARWICK HOUSES.

yard of considerable dimensions, and was of some importance when the highway from Brantmery to Warwick passed by it, when the old bridge was in existence a century ago. In its selected position it is little known, save to architects and artists, with whom it is a favorite subject.—*Build. and Eng. Times.*

THE RELATION OF DOMESTIC CHIMNEYS TO THE CONSTRUCTION OF ROOFS.

There is no detail in house construction so perplexing as that of chimneys, especially with those addicted to so-called smoking, that is, to not passing the smoke in the way intended, but periodically admitting it into the apartments. By the same rule, there is no detail about which so little is known, or which is subject to so much neglect in house planning and building. There are few who will deny the assertion that faulty chimneys are the rule, and that perfect ones are the exception, or that their faults arise from a variety of causes.

In the present chapter we propose to deal with the relation of chimneys to the construction of roofs, and to leave the character of the grate, the construction of the chimneys, the temperature of the rooms, the supply of air, the situation of the flue in internal or external walls, and their size and form, for subsequent review. There is a common belief that in whatever position a chimney is situate, it is only necessary to carry it up to the height of the roof ridge; this is a popular error, and one that has intensified during the last century.

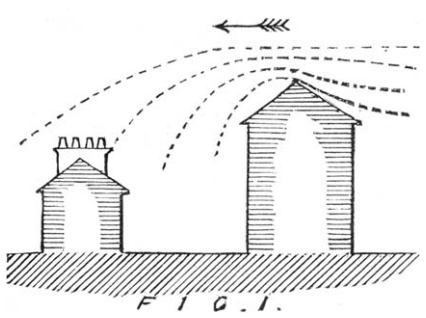


FIG. 1.

From the period of the old open fires of our ancestors, when the inmates breathed the wood or peat smoke, which mainly escaped from penthouses on the ridges of the roofs, there was a gradual advancement in the detail of chimney construction to the time of Queen Anne. The fire hearth had been moved from the center of the apartment to the wall, and the fire itself placed against a reredos, beneath a capacious chimney. These chimneys, in their infancy, were constructed of wood, lined or pargeted with clay, as may still be seen in our rural districts; or they were of brick, being independent constructions to the half timber buildings, as seen in Gainsborough Old Hall. At the Queen Anne period, when houses were built of brick, the chimneys, although amalgamated with the buildings, remained important features of construction, and as such were carried to a great height above the roofs.

In some cases these Queen Anne chimneys were carried up with the gables, in others they rose from the level of the eaves; but in every instance their height was far superior to that of the ridge of the roof. From this date there was a gradual reduction in the capacity of the flues, a movement warranted by the introduction of grates, one which reduced the height and strength of the chimneys, and made them secondary features in house building.

It is to this custom, the one followed, with few exceptions, by the builders of to-day, that we wish to confine our remarks.

Perhaps there has been no former period in the history of house building in which smoky chimneys have been so common as they are at the present day. Certainly there has been no period when chimney doctors, patent coals, etc., were so numerous. This, in large measure, is owing to the use of gables and steep-pitched roofs, details credited to the so-called revival of Gothic architecture, a style which introduced long and artificial lines of ridges, which act as screens for the wind, and disturbing details in the working of chimneys. The steep pitch of such roofs disturbs the passing wind, at one time raising it over the ridge, and at another depressing it, and causing down-draughts in the adjoining flues. If the chimneys of a house are to work, a flat roof is of all kinds the best. The second best is a roof with a low pitch hipped at all points. The third best is a high pitched hipped roof, and the worst of all is a high pitched roof freely gabled.

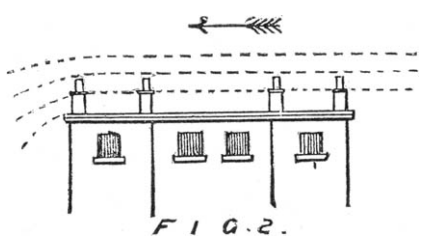


FIG. 2.

In the relation of domestic chimneys to the construction of roofs, it must be borne in mind that defects only present themselves in certain states or directions of the wind, and that, however a builder might try, he cannot succeed in constructing a chimney that will smoke under all circumstances. The wind in certain directions is favorable to the working of a defective chimney; in other cases it is opposed to it, and hence the construction of a chimney that will work under all states of the wind is a desideratum.

There are certain sites of houses in which it is impossible to construct chimneys which will satisfactorily work under all circumstances, such as that of a hillside. In certain states of the wind it will come over the top, and pass down the hill, falling to the gradient of the land; in such cases, down draughts are created in the chimneys. In proof of this we can point to a steep pitched gabled house on a hillside, on the skirt of an important town; it is the highest house of all, and its chimneys are black over with smoke, and a great number of them are surmounted with smoke preventing cowls. The best sites are those on the summit of hills or on open level land, those in valleys being superior to those on hillsides. All outward circumstances being in favor, we will consider the various forms of chimneys in relation to the construction of roofs by the aid of diagrams. In doing so, we must assume there is no adjoining property overtopping the chimneys, as in Fig. 1, which shows a 40 foot street, with two story houses on one side and a tall mill upon the other. Here we see the wind passing over the tall building, damping down the chimneys of the houses, which, were it in an opposite direction, would create an up draught. Fig. 2 shows a flat roofed house, which has no influence upon the working of the chimneys.

Fig. 3 shows an ordinary row of houses, with an ordinary pitched roof. The flues at the ridge will work under all circumstances (so far as their outward construction is concerned), while those placed at a distance from that point will smoke, as they are within the influence of the falling air; and hence it is customary to see the outside flues (if regularly used) raised or surmounted with cowls. Fig. 4 shows a very bad style of chimney, viz., that placed upon the eaves of a roof. If the roof is of flat pitch, and not very long on the span, such chimney may be relied upon to work if carried up a good height; but if the pitch is high or steep, and the span large, the evil is intensified; and such chimneys may be seen raised stage after stage, and surmounted with patent cowls, the whole stayed with iron bars to the roof, presenting appearances truly dangerous. Fig. 5 shows a familiar form of placing chimneys on the eaves of steep roofed houses. Fig. 6 shows the roof plan of a house where a steep pitch is indulged in. The chimneys A and B will not work when the wind is traveling from left to right, because a vacuum is created at that end of the building, which causes a strong down draught in the air passing the line of the ridge. The other chimneys, so long as they are the height of the ridge, will work under any circumstances. We have this case actually before us: A and B are the only chimneys which have been raised on the building, and these flues are fitted with smoke-preventing pots and cowls of various patterns. The B flues are much the worse, owing to a fall in the ground, the house being much the highest at this point. The chimney stacks are a dangerous height above the eaves, and are supported by iron stays. There are ladders on the roof, and reared against the chimney at B, as if permanently in use. With all this paraphernalia, the passer-by may see at a glance that these chimneys are not satisfactory in their working.

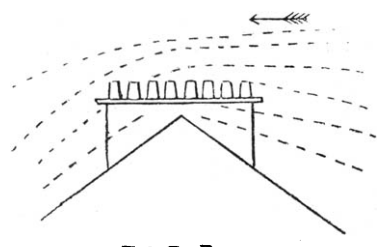


FIG. 3.

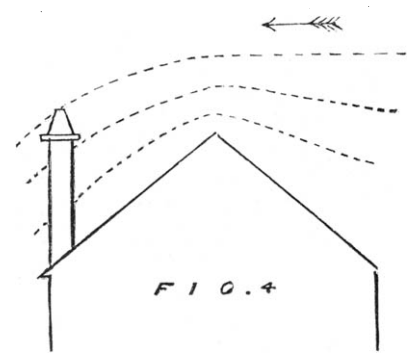


FIG. 4.

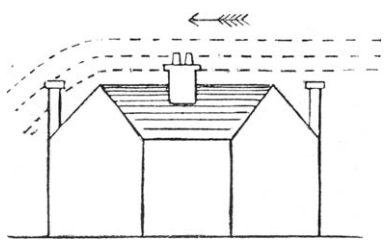


FIG. 5.

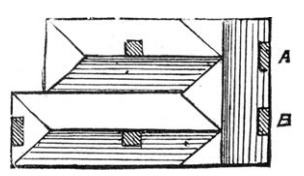


FIG. 6.

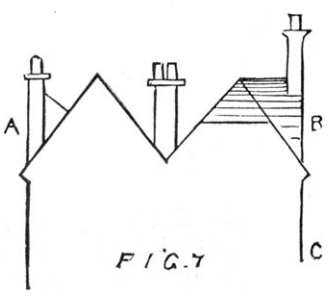


FIG. 7.

In house planning, the disposition of the chimneys is a matter of great importance. Steep pitch roofs may be indulged in if the flues are carried up in the ridges. Gable-creating cross ridges should be avoided; but where necessary, two gables are advised. The chimney, when not convenient to be at the ridge, may be placed between the two, as in Fig. 7. Where it is imperative to place the flues on the eaves, as in A, Fig. 7, the roof should be gabled at the back to support the chimney, as at B, Fig. 7, by which a greater height may be safely indulged in, a further improvement being wrought by hipping the front gables. When the wind is coursing left to right, it falls on passing the ridge to fill the vacuum at *c*, and in avoiding this down draught the chimney must be carried a great height. The force of hipping the main gables and shortening the ridge is thus seen, as it tends to give the chimney an increased

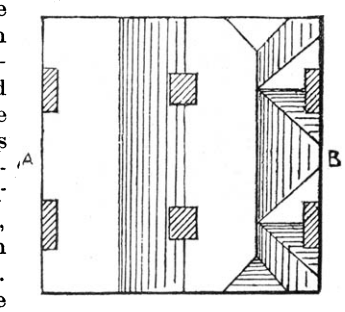


FIG. 8.

height in connection with the falling current of air. A very stupid arrangement is commonly carried out in middle class houses, of the kitchen being built out at the back, and the range being placed at right angles with the back wall, some two or three yards distant. The flues are here gathered over to the back wall, by which they are particularly horizontal at their junction with the main building, up which they are conveyed to a chimney at the eaves, as at Fig. 4. As is well known, such flues rarely work, and are most difficult to clean. A far better plan would be to place the range along the back wall of the main building, giving the full width to the narrow kitchen, and carrying the flue past the line of the eave to a height superior to the ridge, and protecting it with a gable, as at Fig. 7, B. Fig. 8 shows the roof plan of Fig. 7, where A is the ordinary faulty mode of construction, and B the improved mode of gables supporting the taller chimneys.

We have said sufficient to show that the subject of "The relation of domestic chimneys to the construction of roofs" is one worthy of great and careful consideration. That it has not had the attention it deserves is most true, proof of which is furnished every day. We can instance a large builder of fifty years' standing, who resided in a house in which the chimneys were constructed on the principle of Fig. 7, A. He dare not raise the brickwork of the chimney, and trust only to stays from the roof. The only course which appeared open to him was to fix pots and cowls designed for the prevention of smoky chimneys. This he did, indulging in about half a dozen varieties in three years; they all failed, and he had to leave, having built himself a house on adjoining land, on the same roof and chimney model.—*Building News.*

Tests of Stained Glass.

I have discovered a simple mode of testing whether, on the one hand, glass is sufficiently opaque so as not to appear flimsy or watery when put up in a window, unassisted by shading, according to the practice of the flat style of glass painting; on the other, whether it is sufficiently clear to produce as brilliant an effect as the old does. As follows: If the glass, when held at arm's length from the eye, and at the distance of more than a yard from an object, does not permit of that object being distinctly seen through it, the glass will be sufficiently opaque. And if when held at the same distance from the eye, and at the distance of not more than a yard from the object, permits of its being distinctly seen through the glass, it will be sufficiently clear and transparent.

I have found this to be the case with a great many pieces of glass of the twelfth, thirteenth, and fourteenth centuries, which had been rendered clear by polishing the surface, or which were already quite clear; for it is a great mistake to suppose that all old glass has been rendered dull on the surface by exposure to the atmosphere. I have seen a good deal of glass of the twelfth and thirteenth centuries that is as clear now as when it was first made, its surface not having been corroded in the least. But the glass of which these imitative works are made is either smooth on the surface and so pellucid or watery as, when held at arm's length, to permit of any object being perfectly seen through it which is at the distance of 100 or even 1,000 yards, or more; or else is artificially roughened on the surface, a practice which reduces the condition of the glass nearly to that of ground glass, for, when held at arm's length, it will not permit of any object being seen distinctly through it which is distant more than an inch from the glass.

The practice, not unfrequently resorted to by the imitators of old glass, of *antiquating* smooth surfaced glass—that is, dulling it with the enamel color used for painting the outlines—renders it, when held at arm's length, nearly if not quite as opaque as rough surfaced glass; indeed, almost the only perceptible difference in this respect between rough surfaced glass and smooth surfaced glass that has been antiquated is that the former is free from the tint necessarily imparted to the latter by the enamel color with which it is antiquated. Thus we find that imitations of glass of the twelfth, thirteenth, or fourteenth century, if executed in smooth surfaced glass that has not been antiquated, are very poor and watery in comparison with original work of the period; and that, if executed in glass that has been antiquated, or rough surfaced glass, they are much too opaque. In the one case, to speak popularly, the vision passes too uninterruptedly through the glass; in the other it is stopped at the surface of the glass, instead of passing about a yard through it, as in the case of ancient work.—*C. Winston, in The Architect.*

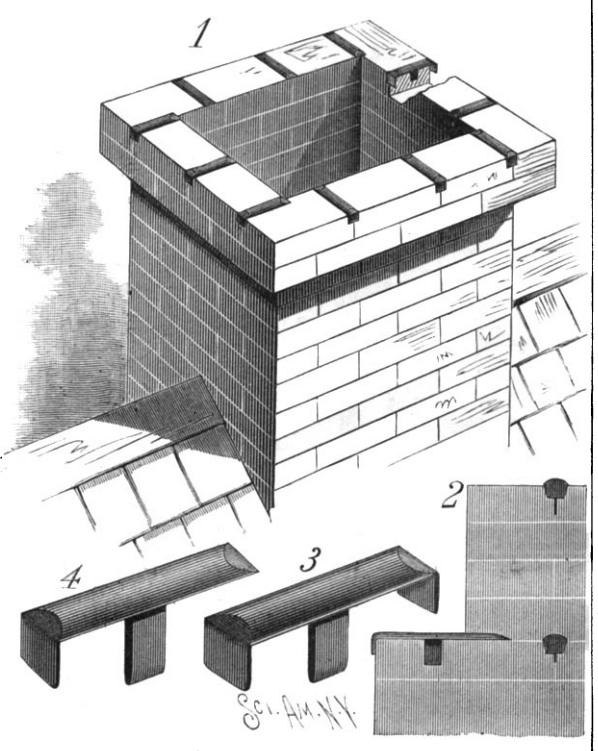
Westward the Squirrel.

Millions of squirrels are stated to be emigrating from Mississippi to the more elevated grounds in Arkansas. The plucky little animals swim the Mississippi River, beginning at a point about five miles below Memphis, and continuing from there twenty miles down stream. Thousands of them have been killed by the farmers, who use clubs in place of guns, on account of the immense numbers. A similar emigration occurred in 872.

IMPROVED CHIMNEY CAP.

For durability in exposure to the weather, nothing seems better than the glazed surface of good, well burned brick. But in the upper courses of chimneys the end joints of the brick lack this quality of endurance; the mortar in these joints gives way, the loosening extends, and the whole chimney top falls to pieces. To protect these weak points and still utilize the brick surface in the chimney capping, is the object of the device shown in the accompanying engraving, and for which letters patent have been granted to Mr. J. W. Wetmore, of Erie, Pa.

One of the caps is about 4 inches in length, and crosses a joint from the outside to the inside of the chimney; it is held in place by a thin shank projecting from the under side down into the mortar between the ends of the brick. A flange extends from the outer end, as shown in Fig. 4, and a flange may also be made from the inner end, as represented in Fig. 3, down a short distance along the joint. The cap is convex on the upper and concave on the under side; but Fig. 2 shows a flat cap designed for covering a joint in an offset. In manufacturing chimney caps from stone and cast iron, the sizes must vary in order to adapt them to different chimneys. The advantage of this device is that the cap fits all chimneys built of brick of ordinary size. A builder who



WETMORE'S IMPROVED CHIMNEY CAP.

has used these caps, which are manufactured by the Chimney Cap Company, of Erie, Pa., says: "I examined them in the spring, and found them in good condition. The caps were perfectly firm in their places, the rain and gases and the freezing and thawing not having affected them in the least. There is nothing more to be desired for a complete chimney cap."

The Rotary Iron Jail.

The new jail just completed cost $30,000. Its peculiar feature is that the cells are arranged in the form of a great iron cylinder, which revolves about, so that only one cell is at the opening at any one time. This cylinder is three stories high, there being ten cells on each floor. Its weight is forty-five tons, and this ponderous weight is hung from above instead of turning on a track below. The strangest part of the arrangement is that the great cylinder can be turned by a simple crank with very little force—a man with his left hand moving it readily. When all is complete, it is the intention to have a little water motor in the basement, and then by simply moving a lever the cylinder will be set to rotating.

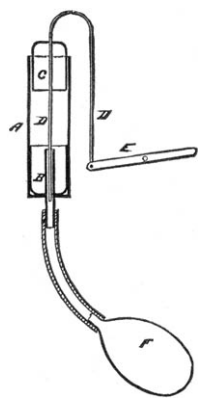
It is suggested that when there are prisoners who it is feared may be trying to cut out, the cylinder can by a motor be easily kept moving slowly all night, so that the prisoners do not remain long enough in one place to do any mischief, or even to crawl out if they had made a partial break. It seems that prisoners have little chance for escape from this new jail. A cage of iron bars completely surrounds the cylinder in which the cells are. The entrance on each floor is guarded by two doors. The officer standing outside does not have to unlock even the first door, but can swing the cylinder around until the cell appears in which is the desired prisoner, and then by a simple movement the inner door is opened, and the prisoner can step out of his cell. Then the officer can open the other door and let the man out, but the other prisoners are way beyond any possible reach of the officer, and it is impossible for them to make any break on him while he is taking a man out or putting one in. He can handle any number of men in the same way, and they cannot get within reach of him until he chooses to let them.—*Omaha Bee.*

PHOTOGRAPHIC NOTES.

INTENSIFIER FOR NEGATIVES.

It is recommended that a plate whitened with a weak solution of bichloride of mercury be washed, and immersed in a weak solution of pyrogallic acid and water. The density is greatly increased, and from three to four plates may be successively immersed in the single solution, after which a fresh solution of pyro should be made.

Simple Pneumatic Release for Shutters.—At a recent meeting of the Society of Amateur Photographers in this city, Mr. Grisdale presented a simple form of pneumatic release, constructed from a common combined patented metal pen and pencil holder. The handle or cylinder of the pen had a punched up coarse thread at each end, into which the shorter tubes holding the pen and pencil screwed, their threads being half an inch from their extreme rear ends. The handle was shortened and the screw thread was cut off, both on it and the pen tube holder; the latter was then inverted and fitted like a cap piston loosely into the handle. The accompanying illustration explains the construction more fully.



A is the handle with both screw threads cut off. B is the lead pencil cap inverted and soldered to tube, A. Through its center is seen a small metal guide tube, over the end of which is a rubber tube leading to a rubber bulb, F. C represents the penholder cap inverted, soldered to the guide wire, D, which passes through its center and also outside downward to the release trigger, E. The wire, D, also fits loosely in the lower guide tube. When the bulb, F, is compressed, the air passes through the guide tube around wire, D, and raises the piston cap, C, thereby elevating the wire, operating the release lever, E, and letting off the shutter. When pressure on the bulb is released, the cap, C, drops back. The cylinder, A, and cap, C, are nickel plated, making scarcely any friction to the movement of the cap.

The object of the lower guide tube is to prevent the cap, C, from binding against the sides of the cylinder. The release worked as perfectly as if it had been expensively made.

Orthochromatic Photographs.—No better proof of the failure of ordinary gelatine dry plates to accurately register the varying intensity of different colors is found than when one attempts to copy a brilliant oil painting or a chromo. Improvements in this direction are always interesting, and to Mr. Fred'k E. Ives, of Philadelphia, inventor of the Ives phototype process, belongs the credit of the development of chlorophyl as a sensitizing medium.

We were recently shown a few comparative specimens made by this process, which were remarkable for their softness and the brilliancy with which ordinary non-actinic colors, such as red and yellow, were brought out. Under each orthochromatic photograph was mounted an ordinary one. One of the drawbacks of the process is that the solution has to be freshly prepared shortly before use, and the exposure necessary is unusually long.

In explanation of the specimens shown us, Mr. Ives states that a wide angle rectilinear lens with the largest stop was used. The exposure was *five* minutes in direct sunlight. When the picture is particularly bright colored, only one or two minutes are necessary; but if, instead of a wide angle lens, a rapid rectilinear lens is used, it is possible, with a brilliant light, to reduce the exposure to less than a minute.

A curious fact observed was that the plates were relatively much less sensitive in a weak light than with bright sunlight, so much so as to require at least *twenty* times more exposure, while the proportion in an ordinary rapid gelatine plate would not be more than four or five times.

Speaking of the emulsion, he says: "The most sensitive plates are prepared with a fresh chlorophyl solution, which has been made up with alcohol tinted with eosine. But no eosine should be used in making up chlorophyl solutions which are to be kept more than a week, because an *old* chlorophyl solution gives more accurate photographs when it contains no eosine."

Regarding some of his recent experiments, he continues: "Lately I have had some emulsion which would not work clear except when the tea organifier was used with it. I would therefore advise any who experiments with the process to use the tea organifier, not only because it increases the sensitiveness to light, but because it may insure better results."

It is probable the line of experiments commenced by Mr. Ives may be followed up by some other interested experimentalist, who may discover a way of making color sensitive plates which will retain their sensitiveness, similar to the ordinary gelatine plate, for any length of time.

There is an ample field for improvement in this direction, and the subject is worthy the attention of all photographers and amateurs.

THE NEW CROTON AQUEDUCT.

For many years the present Croton Aqueduct—the line of which from Croton Dam to the Central Park reservoir is indicated by the heavy dotted line in the accompanying map—has been forced to carry a quantity of water much greater than its builders designed it for, and as a natural consequence it has been so weakened that nothing but the skill and incessant watchfulness exercised by those in charge have prevented it from long ago yielding to the burden thrust upon it. The necessity for quickly providing greater carrying capacity is, therefore, apparent.

It is estimated that, even in years of the greatest drought, the Croton watershed, from whence almost all of the present supply is obtained, can be relied upon to furnish 250,000,000 gallons daily, or 100 gallons per head per day for 2,500,000 people. The building of Quaker Bridge Dam* would increase the available area of watershed to 361·82 square miles, and the reservoir thus formed would have a capacity of 32,200,000,000 gallons—water sufficient to cover 9,400 acres, 10 feet deep. The dam will be built of solid masonry, will be 178 feet high above the bed of the river, and since the foundation will have to extend to bed rock—100 feet—the total height for a distance of about 400 feet in the lowest part of the valley will be about 300 feet; the width of the dam at the base will be about 200 feet, and the extreme length 1,300 feet.

The aqueduct now being built has a maximum flowing capacity of 320,000,000 gallons per day from Croton Dam to a point near the New York city boundary line, where it is designed to construct a large distributing reservoir to supply the annexed district; a part of the supply being there diverted, the remaining portion of the aqueduct has a flowing capacity of 250,000,000 gallons per day. The northern portion, shown in section in Fig. 4, is 13·6 feet high and 13·6 feet wide; the semicircular arch has a radius of 6·8 feet, the concave sides are on a radius of 20·92 feet, and the invert has a radius of 18·5 feet. Where necessary, the rock walls are evened with concrete, and a masonry lining built 12 inches thick at the sides and arch and 6 inches thick at the invert; but where the character of the rock justifies it, no masonry is needed. The other part of the aqueduct, about 6½ miles in length, will be circular in section, as shown in Fig. 3, 12 feet in diameter, and lined with masonry 12 inches thick. Owing to the insufficient elevation of the land, this section will be depressed about 100 feet below the other, as indicated on the profile. The Harlem River is to be crossed by an inverted siphon, the depth below the river being about 200 feet. All the masonry will be of hand made, hard burned brick, laid in cement mortar, one part cement to two parts clean sharp sand.

From Croton Dam to Harlem River the aqueduct is 28¼ miles long, and to Central Park reservoir 33¼ miles; the total length of open cuts—varying from 0 to 40 or 50 feet between the arch and ground surface—north of the Harlem is but about 3,000 feet; all the rest of the line is through solid rock. The method of building the aqueduct is by sinking shafts about one mile and a quarter apart, and working both ways from each. There are 24 shafts north of the Harlem and 8 south of it, varying in depth from 28 to 350 feet. Fig. 1 of the engravings is a longitudinal section through shaft No. 10, showing the heading, the timbering in the shaft, and the location of the hoisting machinery. Fig. 6 is an enlarged view of the same heading. Fig. 8 shows the boilers, air compressors, and hoisting engines. The shaft is 17½ feet by 8 feet in the clear, with the longer dimension parallel with the axis of the tunnel. In the shaft run two cages, operated by a double drum Dickson hoisting engine, on one of which the loaded car is brought to the surface, while on the other an empty car is lowered into the tunnel. Steam for hoisting, pumping, and compressing air is furnished by two 90 horse power Ingersoll return tubular boilers. The Ingersoll "Straight Line" air compressors and "Eclipse" drills are here used; and so well thought of are the products of the Ingersoll Company, that on the line of the aqueduct there are now in use 200 drills, 18 compressors, and 30 boilers of their make. The air compressors at shaft 10 have 18 by 30 inch cylinders, supplying air at 80 pounds pressure per square inch, the air being first discharged into a condensing air receiver, where it is freed from all moisture, and then conducted down the shaft and into the headings through 3 and 3½ inch pipe. Each heading is driven by four 3½ inch drills, mounted two on one column, to which they are attached by means of swinging arms, which can be moved up and down or around the column; thus with two columns and four machines, the entire face is commanded at one setting of the columns. From 19 to 20 holes, 5 to 6 feet deep, are drilled for the center cut and squaring up. Two drills, mounted on tripod, drill from three to five holes 8 feet deep in the bench, some being vertical and others flat or lifting. The holes are then charged with No. 1 giant powder in the cut and No. 2 in the side and bench, and exploded by electricity.

The foremen are required to have a round of holes drilled and blasted once each shift of ten hours, it being left to their judgment to decide the depth of cut they shall undertake to drill, square up, and blast in that time. By this method an average of about 10 lineal feet of tunnel is completed every twenty-four hours in each face through very hard gneiss and granite. This is a higher rate of progress than is attainable by the deep cut system, which does not permit of each shift finishing its own work.

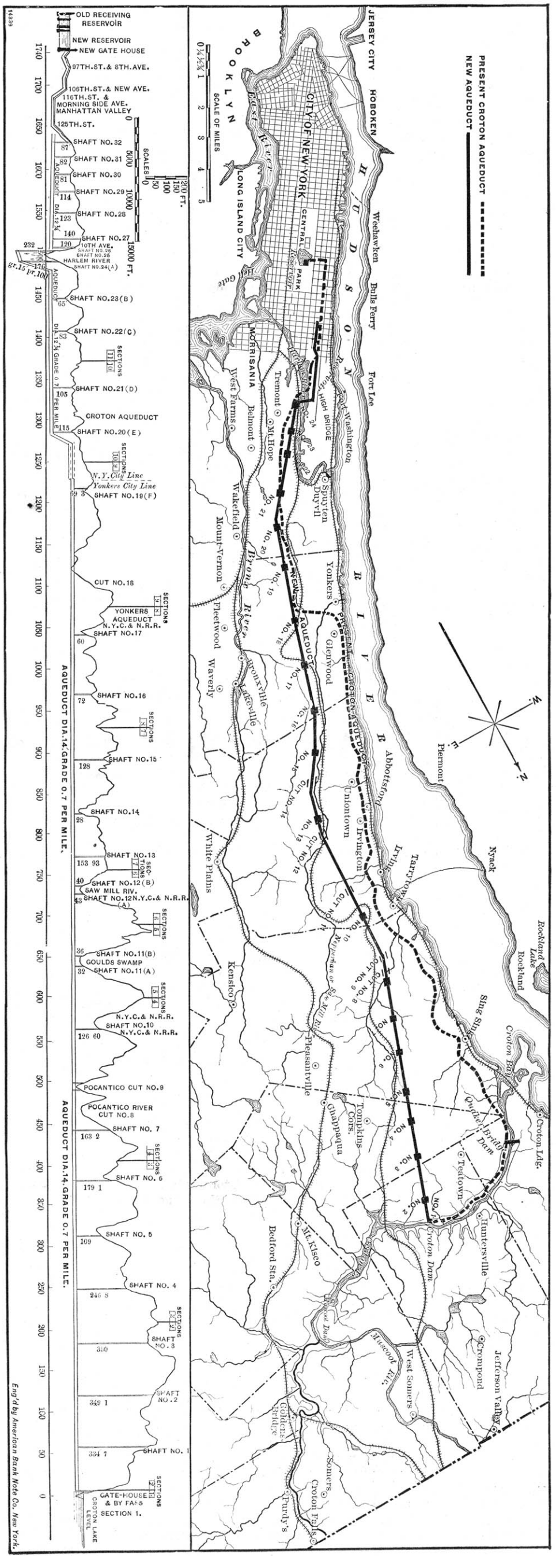
Extending down the shaft is a rough looking square wooden box, which branches at the bottom, one part extending along the tunnel to one heading, and the other part to the other heading. At the bottom of the vertical portion, exhaust steam is admitted; this produces a strong current along the branches and up the shaft. The smoke resulting from each blast is thus drawn into the boxes and delivered at the top of the shaft.

Where the aqueduct is under pressure, special provision is made in the manholes for guarding against the upward pressure, and drain pipes are provided for emptying the shaft and air pipes for the escape of air during the refilling of the tunnel. A general idea of the construction of one of these shafts may be obtained from Fig. 7, which is a section at right angles to the line of the aqueduct.

Fig. 2 is a view of the work as it now appears at the Pocantico cut—the most extensive on the line, as it has a length of about 1,800 feet. The aqueduct here is similar in sec-

* The proposed dam at Quaker Bridge was illustrated and described in the SCIENTIFIC AMERICAN of May 3, 1884

MAP AND PROFILE OF THE NEW AQUEDUCT FOR INCREASING THE WATER SUPPLY OF NEW YORK CITY.



tion to one in rock, as may be seen by comparing Figs. 4 and 5. It has a clear height of 13·53 feet and an extreme width of 13·6 feet. The arch is 12 inches thick at the crown, 16 inches thick at the center of the sides, and 20 inches thick at the spring lines. The concave sides are 8 inches thick and are secured by walls, as shown in the cut. The invert is 12 inches thick, and rests upon a concrete foundation.

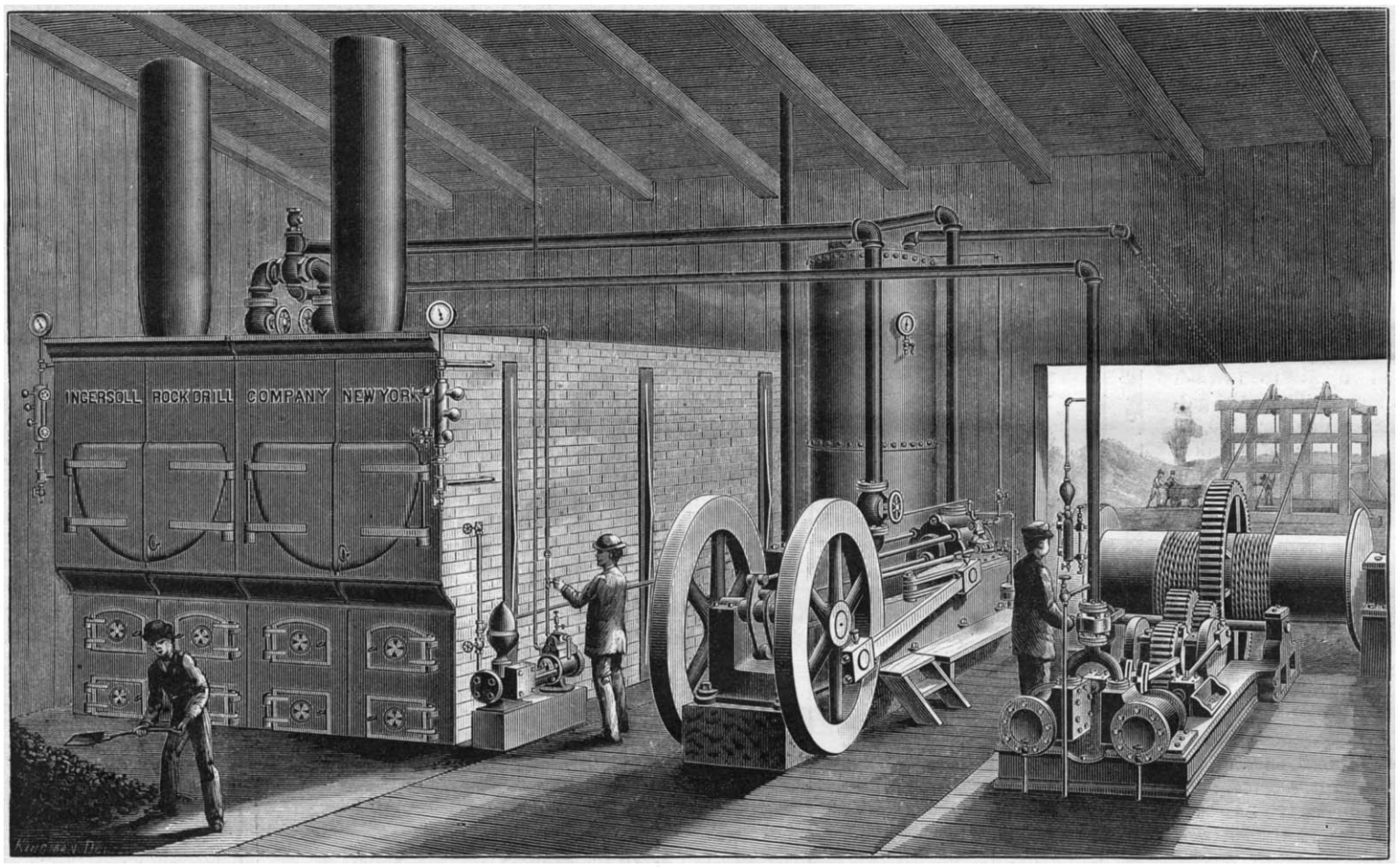


Fig. 8.—THE INGERSOLL PLANT AT SHAFT No. 10, ON THE LINE OF THE NEW AQUEDUCT.

At 135th Street a gate house will be located. Contracts have been let for all the work, with the exception of this gate house and the inverted siphon under the Harlem. The Quaker Bridge project has not yet been definitely settled upon. The contracts have been awarded as follows: Sections A and B to Mr. Heman Clark for $2,147,740; sections 9, 8, 7, and 6 to Messrs. O'Brien & Clark for $4,445,447; sections 5, 4, 3, and 2 to Messrs. Brown, Howard & Co. for $5,297,155; and the gate house at Croton Dam to Messrs. Smith & Brown for $442,000. On the 24th of October the total length of tunnel completed was 22,342 feet, and at the present time the excavation is growing at the rate of one mile per month.

The engineer corps is composed of the following named gentlemen: Mr. Benj. S. Church, chief engineer; Mr. A. Fteley, deputy chief engineer; Mr. H. S. Craven, constructing engineer; Messrs. Chas. S. Gowen, J. B. McIntyre, J. W. Wolbrecht, Alfred Craven, E. S. Gould, F. W. Watkins, and E. Wegmann, Jr., division engineers; Mr. F. S. Cook is in charge of the draughting bureau.

Improved Tent.

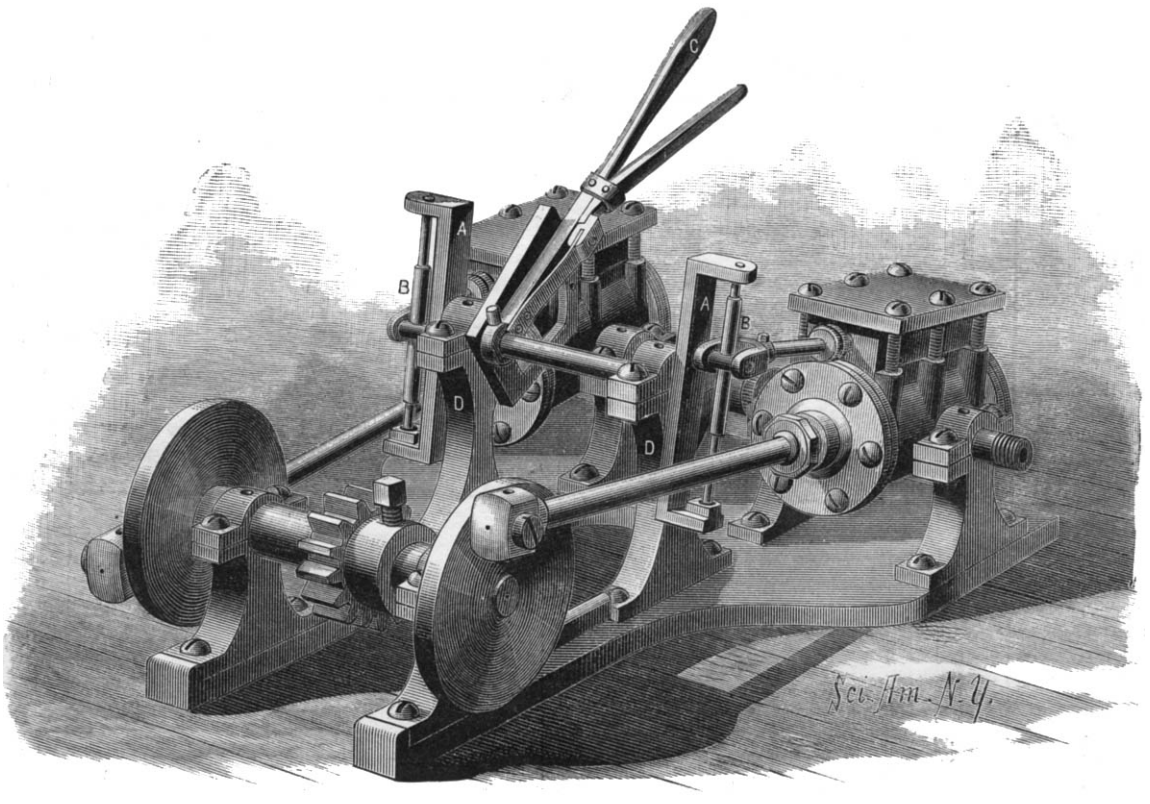
New felt tents were recently introduced in the Danish army. They are composed of rectangular wooden frames, on which felt is tightly stretched. Being of rectangular form with vertical sides, these tents occupy comparatively small space; they are very stable, need not be fastened with ropes to the stakes as is the case with canvas tents, and their erection requires but a few minutes. Felt being a bad conductor, these tents afford a good shelter from cold and heat, and withstand action of moisture better than canvas tents.

TITIAN R. PEALE, of Philadelphia, died on the 13th of March, 1885, in his 86th year. Mr. Peale was one of the naturalists of the Wilkes Exploring Expedition. He was for twenty-four years connected with the Patent Office at Washington.

A NEW LINK MOVEMENT FOR REVERSIBLE ENGINES.

In the reversible engine shown in our engraving, the cylinder is of the usual slide valve order, and operates the valves by its oscillation on the supporting trunnions. The inner trunnions form the inlet pipes, and the outer the exhausts. The slide valve rod is flexibly connected with the sleeve, B, which slides up and down on the rod of the link, A. This flexible connection permits the sleeve to adjust itself to any inclination of the link.

To the ends of a transverse axle supported in the standards, D, the links are rigidly attached, and are thus capable of a backward or forward motion, their position being determined by that of the reversing lever, C, also rigidly attached to the transverse axle. A direct or reverse motion is given to the piston by altering the inclination of the links, and consequently, through the sleeves, of the slide valve rods. Like all other reversing engines, there is a dead center, so that the steam can be cut off by the reversing lever. The action of the links hastens the opening and closing of the ports, and the steam therefore works more expansively than when the ports are operated by an eccentric. This link movement effects a great saving of friction by dispensing with all eccentrics, crossheads, crosshead slides, eccentric yokes, rods, etc., while the first cost of the engine is fully one-third less than that of the ordinary type. The absence of these parts makes the engine compact, and reduces the necessary weight of the bed plate. It is an engine particularly adapted for hoisting, propeller, or traction work; and besides the great advantage of the simplicity of its parts, makes less noise, even when much worn, than the ordinary link movement when new. The motion of the valve being derived from the sliding of the sleeve up and down on the inclined rod of the link, there is no sudden stop, and consequently no hammering. We have shown the movement applied to a double cylinder hoisting engine, but it will also operate with a single cylinder for stationary work.



BAUM'S NEW LINK MOVEMENT FOR REVERSIBLE ENGINES.

Any further information concerning this invention may be obtained from Mr. T. J. Baum, 79–81 Race St., Cincinnati, Ohio.

General George B. McClellan.

Speedily following the death of Gen. Grant has come that of another of the great generals of the Union Army during the late war, Gen. George B. McClellan, who died very suddenly, from neuralgia of the heart, on the morning of October 29, at his home on Orange Mountain, N. J. He was not quite 59 years of age, and his condition was apparently so robust that all who knew him thought there were yet many years of an honored and useful life before him; but his death occurred in about three hours from the fatal attack, after a day of but ordinary business activity. Since the war, besides having served a term as Governor of the State of New Jersey, Gen. McClellan has filled various important positions, in which his abilities as an engineer and a man of broad executive capacity have been conspicuous. Personally, he was loved and honored by all who knew him.

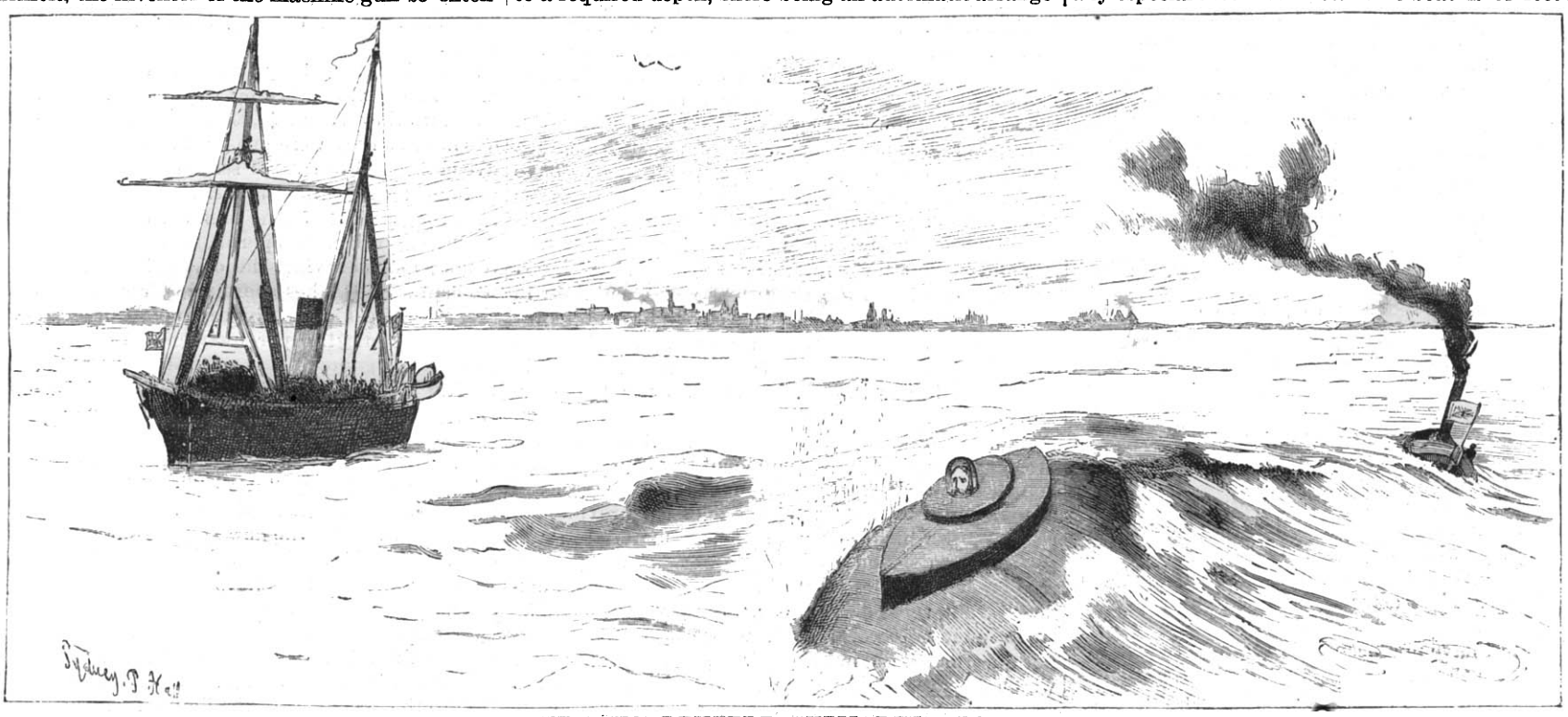
Agee's Improved Corn Planter.

In the SCIENTIFIC AMERICAN of October 24, 1885, we described and illustrated an improved corn planter possessing many excellent features. It is simple in construction and reliable in operation. The present address of the inventor, Mr. George S. Agee, is West Plains, Howell County, Mo.

FRENCH paper makers are highly elated at the Government's resolve to abolish the tax on papers, which has been in force since September, 1871. Though not coming into operation until December 1, 1886, they are still satisfied, as the battle they have been fighting has been a terribly uphill one.

THE NORDENFELT SUBMARINE BOAT.

In September last, just before leaving Denmark for the south, the Prince of Wales, with the King and Queen of Denmark and the Czarina, witnessed off Landskrona, a town on the Swedish coast, an interesting and successful trial of the new submarine boat which has been built at Stockholm upon the plans of Mr. Nordenfelt, the inventor of the machine gun so extensively used in modern warfare. Ever since the American civil war, naval engineers have been striving to solve the problem of submarine navigation, but until now with very little success. Mr. Nordenfelt's invention, however, appears to fulfill the numerous requirements for overcoming the difficulties and dangers of maintaining, driving, and directing a boat beneath the water.

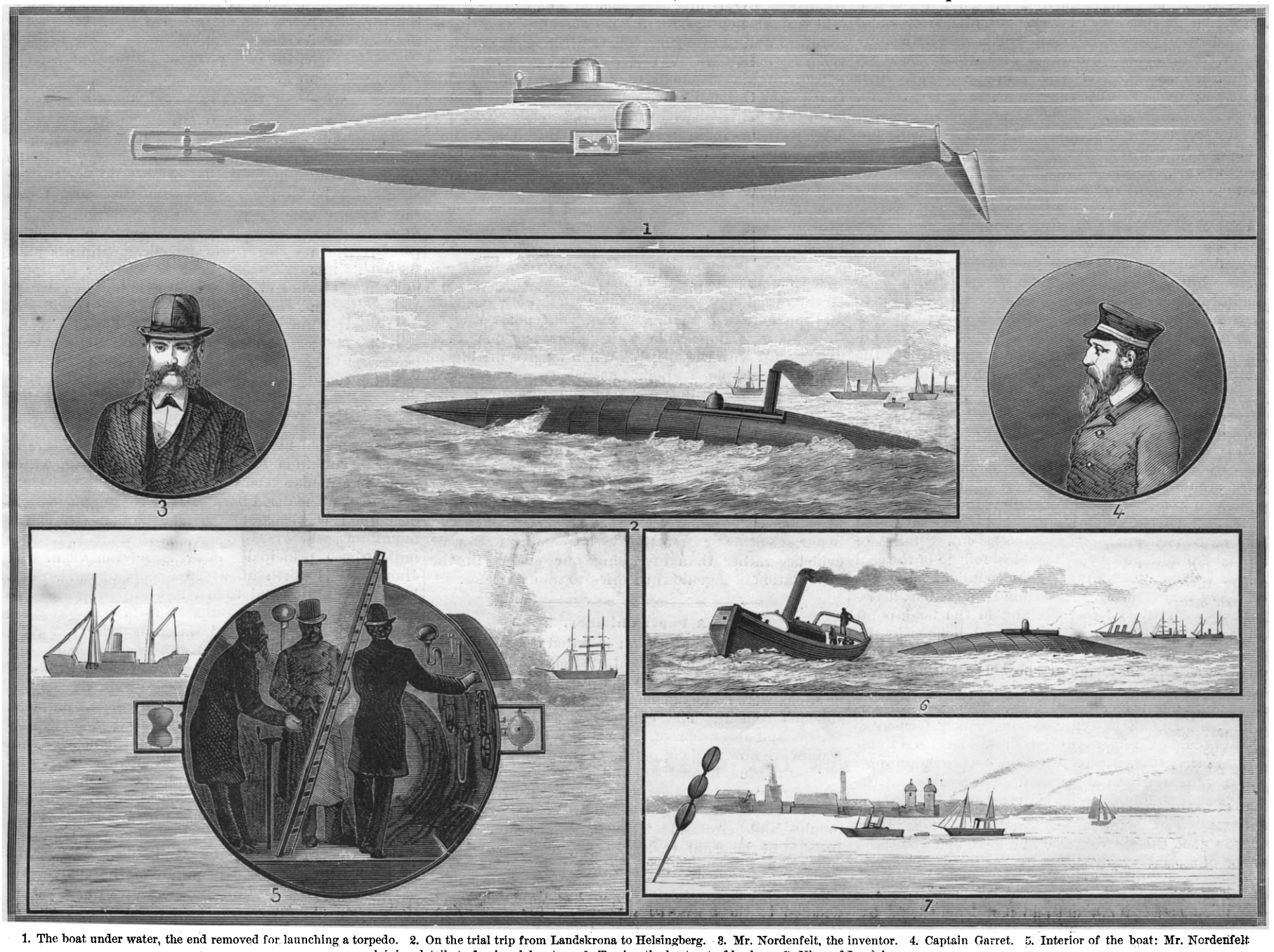


THE NORDENFELT SUBMARINE BOAT.

The boat is built of steel, and is cigar-shaped, with a glass conning tower in the center, from which the commander can keep a lookout. This dome is protected by a strong iron cover. There are three engines, one to work the screw in the stern, which propels the vessel, and two to work the propellers on either side, which, when set in motion, compel the boat to sink, and maintain her at a certain depth beneath the surface. When it is wished to sink the boat, enough sea water is taken in to reduce the buoyancy to 1 cwt., and this suffices to keep the tower just above the surface. The side propellers then being set in motion, the vessel can be sunk to a required depth, there being an automatic arrangement by which the engines are stopped directly that depth is exceeded. An automatic horizontal steering gear also prevents the boat from going down or up head foremost, an even keel being preserved throughout all the maneuvers. Should a breakdown of the engine occur, the boat from its own buoyancy at once rises to the surface.

The motive power is steam, and as long as the vessel is above water the fires can be stoked, the smoke being driven through two channels, which pass partly round the hull and point aft. When, however, the boat sinks, the fires have to be sealed, and reserve steam is used, which is kept at high pressure in two tanks. With this the boat has been driven for five hours at a speed of three miles an hour. Her speed on the surface is eight knots. The crew number three, and during their submarine existence have to subsist on the amount of air which they take with them in the hull, in which four men have subsisted for six hours without any especial inconvenience. The boat is 64 feet long, and the central diameter is 9 feet. The enormous utility of such a vessel as this in naval warfare is at once apparent. Moving without the slightest apparent sign of existence, she can launch torpedoes against hostile vessels, enter a harbor unperceived, and render useless the most complicated system of submarine mines. The trial at Landskrona was witnessed by officers representing every European power. Admiral Arthur and Major-General Sir Andrew Clarke were among those representing the English services.

We are indebted to the *Illustrated London News* and London *Graphic* for our sketches.



1. The boat under water, the end removed for launching a torpedo. 2. On the trial trip from Landskrona to Helsingberg. 3. Mr. Nordenfelt, the inventor. 4. Captain Garret. 5. Interior of the boat: Mr. Nordenfelt explaining details to foreign delegates. 6. Towing the boat out of harbor. 7. View of Landskrona.

THE RECENT EXPERIMENTS WITH THE NORDENFELT SUBMARINE BOAT AT LANDSKRONA, DENMARK.

Correspondence.

Origin of "Atlantic."

To the Editor of the Scientific American:

The correction made in your edition of the 17th of the present month, by G. W. R., of the etymology of the word *Atlantic*, from the Nahuatl *Atl*, water, *tlan*, near, between, we gladly would receive, were it not that it contains *tiny wee* flaws which greatly want repairs, although of no consequence to the kind corrector.

He informs his reader that the word *Atlantic* is derived from the Greek *Atlantikos pelagos*, which means *the open sea Atlantic*, though he has rendered it *beyond Mt. Atlas;* but he has forgotten to tell him also wherefrom the Greeks have obtained the word *Atlantikos*, hence its origin, and he has likewise failed to explain the etymology of the name of the patient old god *Atlas*, who is said to have sustained so long the whole world on his shoulders.

Truly, we would like him to give us the origin of these names; for to explain one by the other would seem like beating the devil round the stump a little too much.

AUGUSTUS LE PLONGEON, M.D.

204 Washington St., Brooklyn, Oct. 22, 1885.

The Star in Andromeda.

To the Editor of the Scientific American:

There does not seem to be the slightest evidence that the bright star which appeared in 1572 in the constellation of Cassiopeia had ever been authentically observed before. Most astronomies mention that a star appeared in the same position in the heavens in 945 and 1261, but have not been able to prove that it was identical with the Pilgrim.

The present attempt to identify the star recently discovered in the nebula of Andromeda with this Pilgrim star of Cassiopea seems very fanciful when one reflects for a moment what an incalculable distance separates the two positions, and what an incredible velocity would be required of this wandering star to traverse the space in the brief period of 313 years.

GEO. R. CATHER.

Ashville, Ala., Oct. 19, 1885.

At the Interior.

PORPHYRY DYKE.

Chemistry is still a new science; it was only in 1776 that Priestley discovered oxygen, and until then the science can scarcely be said to have existed; for without a knowledge of this essential element, all systems and methods were purely empirical. But in this little more than a century many wonderful results have been accomplished, and the new science ranks quite as high in its progressiveness as those of more ancient origin. Working with its sister sciences of physics and geology, the life history of our planet is being gradually unfolded by its aid; the cataclysms which the older philosophers were contented to offer as explanations of all past operations of nature are now fading altogether from sight, and giving place to a belief in the continuity of natural forces. Men are no longer content with these vivid pictures of the imagination, and ask, instead, the sober deductions from observed facts. The forces which have been observed in operation during the historical period are found to be all sufficient to explain the present condition of the earth.

This tendency toward the rational method has nowhere been better illustrated than in our study of the interior of the globe, and of the reactions which occur in this subterranean laboratory. No uniformity of belief has been attained, it is true, but the questions have been handled more scientifically. The origin of coal is a case in point. The early geologists pictured the carboniferous swamps, where the vast stores of fuel were accumulated, as covered with great forests of lepidodendrons, sigillaria, calamites, and gigantic tree ferns, and enveloped in an atmosphere so saturated with carbonic acid gas that only the lowest forms of animal life were possible. The ideal foliage of the coal period is a diagram familiar to most students, and it is certainly very striking. Now, however, patient investigators with the microscope, and in the field, point out to us the structure of mosses and lichens in the apparently structureless coal, mere weeds by the side of the pictured giants, and show us the undeniable similarity between the ancient swamps of the carboniferous and our present peat beds. The excess of carbonic acid gas in the atmosphere, which formed so pleasant and convenient an hypothesis, has been so far reduced that there is even a doubt whether the amount was any greater than at present. The position of the coal beds is no longer ascribed to the sudden sinking of the carboniferous formations and the rapid accumulations of the superimposed strata.

The gradual settling of the bed of the Pacific and of portions of the coast of Northern Europe offer a sufficient explanation for the change of level which in time submerged the coal swamps and permitted the deposition of the Mesozoic and Tertiary rocks, which in turn produced by their weight the pressure and heat necessary for the consolidation of the peat into coal. The origin of rock oil, or petroleum, has led to even greater discussion than the question of coal; for beyond the observation that it comes from the rocks immediately underlying the coal formation, the Devonian system, few facts regarding it are known, and the fancies of the theorist have therefore a fertile field for their generation. There are so many possibilities that there is an unusual chance for originality. It is generally conceded that the oil has not originated *in situ*, but has come either from above or below, from the distillation of the volatile constituents of the coal deposits, which have descended and become condensed in the Devonian sands, or from the destruction of vast beds of seaweed or other organic matter in the Silurian below. The idea that the amount of petroleum is too great to have originated from either vegetable or animal deposits has given rise to still another theory, which supposes that the oil originates from chemical combinations of hydrogen and carbon in the interior of the earth.

Our knowledge of the conditions which maintain in this interior laboratory is still too slight to warrant any definite assertion in regard to the possibility of such a reaction occurring on the large scale; but we do know that in our surface laboratories the hydrocarbons in this series are derived from the decomposition of more complicated hydrocarbons, and not from a direct synthesis of the component elements. Baron von Richthofen's explorations in China have disclosed a single anthracite coal field in one of the provinces of that empire which contains sufficient material to supply the coal demand of the entire world at the present rate of consumption for over 2,000 years. These evidences, and those derived from the vast beds of limestone found the world over, whose organic origin is not questioned, do not lend support to any argument which disputes the organic source of petroleum on the supposition that such an origin would tax the life resources of the planet.

When any object becomes prominent, it is very natural for us to want to know where it came from, and its history. If it be a man who attracts our attention, we want to know his record, and later of his ancestry. The biography of an invention which attains a wide application becomes of great interest to us. The crude materials of large industries or the staples of everyday life have a place in history. Products of such importance as coal, petroleum, and natural gas excite a curiosity aside from either scientific or economic considerations, and to learn their history means the comprehension of many modifying conditions. Our investigations in this direction are still very elementary, for the simple question of temperature and the varying effects of pressure in modifying its action are still under discussion. The latest effort to obtain some definite information on this point, that of the German Government in sinking the deep shaft near Schladebach, which has gone down nearly 5,000 feet, has really told us but little. The deductions drawn from this very slight puncture are that at a depth of about two miles the temperature of boiling water would probably be reached, and at forty-five miles the heat of melting platinum would prevail—that is, the temperatures at which water boils and platinum melts at the surface; but when the effect of pressure is considered, we are uncertain that the temperature of boiling water is ever reached. In the radial race between the actual boiling point and the increased temperature of that point due to pressure, it is impossible to say that the one ever catches up with the other. When we are unable to decide so simple a point as whether water can ever reach the boiling point in the interior of the earth, the more complicated processes of chemical decomposition and reformation seem quite beyond our grasp; but a fuller knowledge of the chemical and physical laws which maintain under ordinary atmospheric pressure and temperature will go far toward the explanation of those hidden processes which take place beneath the surface. It is an encouraging sign in our scientific progress that we are coming to consult evidence rather than exercising our energy in the formulation of ingenious theories to take its place.

A Paper Chimney.

A manufacturer of Breslau is stated to have built a chimney, over 50 feet in height, entirely of paper. The blocks used in its construction, instead of being of brick or stone, were made of compressed paper, jointed with silicious cement. The chimney is said to be very elastic, and also fireproof. We may add that picture frames are now made of paper on the Continent. Paper pulp, glue, linseed oil, and carbonate of lime or whiting are mixed together and heated into a thick cream, which, on being allowed to cool, is run into moulds and hardened. The frames are then gilt or bronzed in the usual way.

IN Memphis, Tenn., sixty buildings have been condemned by the authorities as unsafe for habitation. Owners are required to put them into habitable condition or to demolish them. Most of them will be torn down and new dwellings erected.

Liquid Fuel in California.

A few months since, we gave an account of the experiments which were being made by the Central Pacific Railroad Company with petroleum as fuel on some of their steamboats. At that time they had tried it upon the freight steamer Thoroughfare, plying between Oakland and San Francisco, and on the transfer boat Solano—the largest ferryboat in the world—on Carquinez Straits, running between Benicia and Port Costa.

Since that time they have been able to determine more in detail concerning the results. On the Thoroughfare they saved $7,000 in the cost of fuel in the five months they were using oil as compared with the five months of the same season last year, when they were burning coal. Besides saving 44 per cent in actual fuel, they got rid of four firemen, which makes an additional saving of $240 per month. On the Solano there is not so much saving, the cost being lessened but 17 per cent. She makes short trips, and they burn the fuel while she is in the slip, to generate necessary steam.

The oil costs $1.70 per forty gallon barrel, or about four cents a gallon. It is estimated by the engineer of the big Water Witch, which is also using oil, though a somewhat different kind from that used by the railroad company, that 100 gallons of oil is equal to a ton of coal, which latter costs about $7 per ton.

The Oakland ferryboat Piedmont has just been altered so as to use the liquid fuel. She has not yet been put at work under the new system, but will be in a few days. The oil is sprayed under the boiler by a steam jet, and is supplied by suitable tanks. A supply tank is kept on the wharf, so that the oil may be led into the steamer's tanks. The supply tank is filled from tank cars, so there is no handling. There is no smoke or soot, and of course no ashes. It is stated that in addition to the lower cost of the liquid fuel, the services of 16 firemen will be dispensed with on the Piedmont. The mechanical alterations to effect the change of system are slight. The other ferryboats will be changed to burn oil shortly.

As the coal used on these steamers was imported, and a good deal of California petroleum will probably be used, the change will be good for this State in utilizing one of its products. The amount of petroleum obtained from California has steadily been increasing for the past five years. In 1879, 19,858 barrels were produced, and in 1884 more than 100,000 barrels, thus quadrupling the yield in the space of five years. California now ranks third among the petroleum producing States; New York is second, and West Virginia fourth. The petroleum resources of the State are being carefully developed, and the more of the product we can use here, the better it will be for California.—*Min. and Scien. Press.*

Slag Wool.

Slag wool is a substance produced by the action of powerful jets of steam upon the melted slag from the furnace. It is in fact a species of glass blown out by steam into the form of fine threads. It is incombustible, and in England it is much used in buildings as a filling. In Mansard roofs the space between the exterior covering and the interior lath or paneling is filled with this material. The heat of summer in upper apartments is thus very much mitigated. Used around water pipes and the like, it prevents their freezing in winter. It is an excellent protection when used as a covering for steam boilers and furnaces. It is a nonconductor of heat, and thus it is well adapted for use in lining the air spaces of refrigerators.

Paper in Tonkin.

The principal material used in the manufacture of paper in Tonkin is the *ke-yioh* or paper tree, which grows in abundance on the mountains in the environs of Sontay. The dried bark of this is brought in bundles upon the backs of oxen or buffaloes from the mountains, where it is gathered for the numerous paper mills, whose principal center is in the vicinity of Hanoi. It is worth about two cents a pound. This bark is macerated and then rubbed up in mortars, so as to reduce it to a fine pulp. This latter is extended with a certain quantity of water in order to form a clear paste, which is sized with an infusion made from the shavings of the *gomao*, a tree which grows in abundance on the Black River mountains.

The paper is manufactured sheet by sheet by women by means of delicate bamboo screens that they alternately dip into the paste and take out therewith a thin sheet of paper, which they deposit upon a board. At the end of the day these sheets are put into a press in order to extract the moisture from them, and are then dried by placing them one by one upon a hot masonry wall. Finally they are put up in packages and trimmed.

Each woman makes a thousand sheets a day. The thickness of the paper depends upon the consistency of the paste. One establishment that was visited by the person who furnished these data was capable of producing 80,000 sheets per day with 80 women and 40 assistants. Paper was being made here worth 65 cents per thousand sheets.—*Gutenberg Journal.*

ENGINEERING INVENTIONS.

A governor for supplying gaseous fuel has been patented by Mr. Alpheus Darling, of Petrolia, Pa. This invention covers certain novel features of the governor and its connections to the gas well and boiler, to make the governor more sensitive to variations of boiler pressure, and to more efficiently control the fuel supply.

A surface condenser has been patented by Mr. Benjamin S. Benson, of Baltimore, Md. By this invention the steam is passed through a set of cells in one direction, and condensed by a current of cold air blown forcibly through an alternate set of cells separated only by thin metal partitions, the device being adapted for traction engines or locomotives where water is scarce.

AGRICULTURAL INVENTIONS.

A harrow has been patented by Mr. Franklin McCoy Jansen, of Sheldon, Iowa. It consists of a series of frames with toothed sockets, so arranged that the teeth may be used straight or slanting, so the harrow may be used on rough or smooth ground, or can be made to present more or less harrowing surface, as desired.

A weed pulling machine has been patented by Mr. Edward L. Rasmusson, of Duluth, Minn. It consists of two sets of revolving wheels, with an endless chain and spurs, made to work in a recessed frame, and a device for imparting rotary motion to the chain wheels from the main axle, with an adjustable swinging frame and dragging wheel, to pull out weeds by the roots.

A hay raker and loader has been patented by Mr. Joseph I. Davis, of Mt. Hamill, Ohio. The construction is such that the machine may be drawn behind a wagon, when the hay gathered by a rake is lifted by the teeth of a reel and carried up on an elevator and carrier to be delivered into the wagon, saving time and obviating the necessity of stacking in the field.

MISCELLANEOUS INVENTIONS.

A sewing machine has been patented by Mr. Otto L. Schastey, of New York city. It is a single thread machine, and has a vertically and laterally reciprocating needle bar, to make a cross or binding stitch, especially applicable for sewing edges of material.

A wagon jack and step ladder combined has been patented by Mr. Frank N. McKean, of Long Branch, N.J. It consists of a frame so made with bars to serve as steps as to be readily adjustable for either use, and to be convenient and reliable with either adjustment.

An adjustable chair has been patented by Mr. Hamlet S. Felton, of Chester, Ill. It is made to be folded together very compactly and lowered through an opening in the floor, whereby a room, hall, or theater, with such devices, can be cleared to afford an open floor in a few minutes.

A hat or bonnet support has been patented by Margret Smith, of Baltimore, Md. The device may consist of a bandeau or comb, having elastic pins so secured that when free they will assume a projecting position, and when desired they can be held down out of the way.

A bicycle saddle has been patented by Mr. Robert E. Humphreys, of Irwin, Pa. This invention consists in the combination, with a curved piece, of a spring rod secured and bent to form the supporting springs and horn, making a saddle which will rock forward and back, up and down, and laterally.

A calcimine compound has been patented by Messrs. Samuel U. Brunck and George A. Marsh, Jr., of Sandusky, Ohio. It consists of calcined plaster, cotton seed oil, and water, formed into a paste and afterward dried and ground, for mixing with dry powdered calcimine or other like wall finish materials.

A pencil sharpener has been patented by Mr. Azel Hatch, of Lexington, Ky. This invention covers a broad flat file, with a beveled surface on either of its sides, the broad portion being of a coarse file cut, and the beveled surfaces finer, to rapidly cut away and afterward give a smoother finish to the pencil point.

A calf weaner has been patented by Mr. Edward P. Henry, of Eagle Rock, Idaho Ter. It is for attachment on the nose of a calf, and consists of two plates pivoted to each other at the edges, each plate having a curved prong at the upper inner corner, preventing the calf from sucking, but permitting it to eat grass.

A package has been patented by Mr. James McCrodden, of New York city. Its body is cylindrical, made of straight staves, the lower ends adapted to receive a head and the upper ends beveled to receive a cover, the outer surface to be covered by paper or pasteboard, and the whole making a package especially fitted for grocer's use.

A peach stoner has been patented by Mr. Cager Hardgrave, of Clarksville, Ark. It has vertically standing steel blades to split the peach, and spoon shaped blades acting in connection therewith to open the peach, with other novel features, whereby peaches may be halved and freed of their stones quickly and neatly.

A boot or shoe protector has been patented by Messrs. Thomas Gribble and Robert Abraham, of Calumet, Mich. It consists of a malleable metal bottom plate with studs, and formed with side and toe flanges, which inclose the sole edge and the lower portion of the upper, the invention being especially applicable for miner's boots.

A grinding mill has been patented by Mr. Henry Cutler, of North Wilbraham, Mass. This invention relates to portable mills of the vertical disk type, and provides novel means for the accurate setting and adjustment of the stones to compensate for their wear and to allow of the stationary stone being dressed without removal from the case.

A bridle blind has been patented by Mr. Emory Q. Darr, of Shelbyville, Ind. It is made with a marginal stiffening wire, with a projecting loop to receive the winker stay, and with a stiffening plate pocketed between the facings of the blind and separated from the wire by a row of stitches, all the stitching being done before the plate is put in place.

A gin saw gummer has been patented by Mr. Wesley F. Collie, of Barren Fork, Ark. Combined with a handle is a cross bar integral therewith, and flat teeth riveted to the under side of the bar, and beveled or pointed at their outer ends, the implement being used by slipping it in between the saws while the motion of the latter is reversed.

A method of forming packages of paper has been patented by Mr. Willis M. Hunt, of Glen Gardner, N. J. It consists in providing the bags in corresponding edges with slits, and placing therein a cord covered with glue or other adhesive material, so the bags can be readily pulled from the package, and the package hangs well, occupying little space.

A flat wire netting has been patented by Mr. Emil Rattey, of New York city. It is formed of a series of flat wires or rods woven together, so that at the intersections each wire is bent to form a part which is at right angles to the remaining part of the wire or rod, the netting to be used for office railing, window screens, etc.

A machine for removing snow and ice from sidewalks has been patented by Mr. Edmund R. Angell, of Derry, N. H. It is made with wheels, axle, and handle, and a spring held shovel hinged to a bail rigidly attached to the axle, a cylinder with cutters being connected with the drive wheels whereby ice and crust can be readily loosened.

A combined blackboard and desk has been patented by Messrs. James G. Smith and Hiram E. Butter, of Jamestown, N. Y. The construction is such that the combined article when open may be used as a writing desk and when closed as a blackboard, the board forming the table to the desk when open, and front or door of the desk when closed.

A pencil sharpener has been patented by Mr. Eugene Fitch, of Des Moines, Iowa. Combined with a shell or hollow head is a knife held within its sides, and a clamping spring and handle, with other novel features, making a device which can be conveniently held and manipulated, and will be very securely held on the pencil when not in use for sharpening.

An ointment for the cure of diseases of the hair or scalp has been patented by Mr. Daniel M. Allen, of Fort Wayne, Ind. It is composed of Peru balsam, benzoic acid, oil of cloves, alcohol, creosote, iodine, iodide of potassium, water, vaseline, and calcined magnesia, the ointment to be applied by means of the finger on the scalp.

An apparatus for taking soundings has been patented by Mr. Herman Schoening, of Antwerp, Belgium. The construction is such that as the apparatus is lowered in the water the water rises in a groove and compresses air in proportion to the depth to which the apparatus is lowered, this being indicated by a properly prepared gauge strip to be affected by the wetting.

A thill coupling has been patented by Messrs. Benjamin C. Smith and Charles W. Pride, of Boston, Mass. It has a specially devised frame attached to the axle of the vehicle by a clip, with other novel features which allow of easy coupling and uncoupling, while it cannot be uncoupled when the vehicle is in motion, and is neat and compact.

A spindle for cap spinning and twisting machines has been patented by Mr. William Wardman, of Bristol, Pa. The construction is such that the bobbin can be made longer and have a longer traverse than heretofore, so as to hold more yarn and increase the amount of work done by the machine, as well as improve the quality and lessen the expense.

A bottle cork attachment has been patented by Mr. John W. Hayward, of St. Johns, Newfoundland. Combined with a cord having slits on its sides is a cord or band in these slits, and passed over the inner end of the cork, so the cork can be readily removed without a corkscrew, or the attachment may be used as a seal to tie the cork in the bottle.

An adjustable window screen has been patented by Messrs. Forest M. Lampson and George W. Hogben, of Ripon, Wis. The screen frame has staples and strips arranged at the side of its end portions, headed pins being secured in the strips and working in the staples, the device being intended to fit screens to window frames of different widths.

A washing machine has been patented by Mr. James S. Jones, of Crutchfield, Ky. It consists of a tank in which is hung a drum that is made to oscillate and dip in the water of the tank, the head of the drum carrying a series of internal ribs, and the drum carrying pins for separating the clothes and prevent them from falling down in a solid mass.

An animal trap has been patented by Mr. Sylvester S. Green, of Lead City, Dakota Ter. It is made with a box having a platform and a trap door supported by a spring held lever, engaging a crank driven by a cord and weight, the crank working in a slotted cross head at the inner end, the device working to project the animal caught into a secure inner chamber.

A coal and rock drill has been patented by Mr. James F. Loftus, of Winton, Pa. It is adapted to bore or drill holes horizontally, perpendicularly, or at any desired angle, and is an improvement on that class of drilling machines in which the stem or shank of the drill proper is screw threaded and works through a nut hinged or swiveled to a suitable support.

An aerial railway and car has been patented by Mr. Andrew J. Morrison, of Buffalo, N. Y. It consists of a wire cable supported at intervals by balloons anchored to the earth, a car being suspended from the cable and made to travel thereon by its own gravity, the balloons being arranged to raise and lower the cables so as to give them the proper inclination.

A carpet stretcher has been patented by Mr. George M. Robison, of Leadville, Col. Combined with a plate having teeth on its front edge is a swinging piece above the teeth, a rack bar resting on the plate with a pin on one end, a pawl spring on the plate, and a handle piece for moving the plate and pressing the swinging piece upon the teeth, with other novel features.

A rod and bolt clipper has been patented by Mr. Harry W. Parker, of Omaha, Neb. The stock has a fixed lever with a vertical end aperture opposite a bent hook forming a cutting edge near its outer end; in connection therewith is pivoted a movable lever to move a cutting blade along a cavity, so that its cutting edge will operate with that of the bent hook, to cut wires, bolts, etc.

A fire screen hinge has been patented by Mr. James M. B. Robinson, of New York city. It is made with plates having horizontal slots, vertical recesses, and rounded outer edges, with bolts and nuts, and a connecting plate fitting into the slots of the hinge plates, with pins working in their recesses, whereby the edges of the plates will be kept in contact with each other as the hinges are worked.

A mechanical telephone has been patented by Mr. Francis R. Shaw, of Chatham Center, O. Combined with a diaphragm of fibrous material, having small loops held on its back, are fibrous line wire connecting strips, crossing each other and having their ends secured to the loops, the design being to avoid the harsh metallic ring produced by connections of metal between the line wire and the diaphragm.

NEW BOOKS AND PUBLICATIONS.

LOUIS AGASSIZ: HIS LIFE AND CORRESPONDENCE. Edited by Elizabeth Cary Agassiz. 2 vols., pp. 794. Boston: Houghton, Mifflin & Co.

Although Professor Agassiz was among the greatest of American naturalists, he already had a wide reputation in this field before coming to America in 1846, when he was 39 years old. He was of French descent, born at Motiers, Switzerland, and from his 20th year, while yet a student at the University of Munich, to the end of his life, in 1873, his name occupied a place of steadily growing prominence among the leading naturalists of this century, such as Humboldt, Cuvier, Buckland, Owen, and Murchison. Beginning with the organization of plants and their geographical distribution, he afterward took up the history of fresh and salt water fishes, and in 1833 began the publication of his great work of five volumes on fossil fishes, which was followed by numerous volumes on history and geology, including special studies of glaciers. From 1846 his biography belongs more particularly to the scientific history of the United States. The principal object of his coming here was to study the natural history and geology of the country, as well as to deliver a course of Lowell lectures in Boston. To further his aims, Professor Bache, of the Coast Survey, invited him to use the facilities of that department, to visit every point of the coast in its well equipped vessels. Agassiz deemed this offer so liberal, and of such importance in a scientific point of view, that it had great weight in determining him to remain to the end of his days in the United States; and he accordingly, in 1847, accepted a professorship in the Cambridge Scientific School, founded by Mr. Abbot Lawrence. What he subsequently accomplished is matter of too recent history to call for special mention here, but its influence in stimulating thorough scientific examination in the United States has been profound and far reaching. The two volumes now published by Mrs. Agassiz afford a most charming biography of her distinguished husband, with just enough about the many great works in which he was engaged to be intensely interesting, without ever becoming tedious. These references are, in fact, principally in the letters of eminent men, the correspondence with Humboldt alone giving the means for a fairly comprehensive review of the most important work undertaken by Agassiz, while the biographical portions show the difficulties under which he worked, his great perseverance and indefatigable industry, and well depict the engaging personality of one who for the last half century has occupied a large place among original workers for the advancement of science.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted.—Location on R R. for an established machine business requiring 12,000 feet floor space and 25 H. P. Address A. T. Co., Woonsocket, R. I.

For Sale.—Punch Presses, $15.00. Extra Portable Forges, $10.00. Lathes, Planers, Drill Presses, etc. York & Benton, Cleveland, O.

Woodworking Machinery, Engines, and Boilers. Largest and most complete stock in the U. S. Prices to meet the times. S. C. Forsaith Mach. Co., Manchester, N. H.

Modern Machine Tools a specialty. Abbe Bolt Forging Machines, Bolt and Nut Machinery, Palmer Power Hammers, Lathes, Planers, Drills, Shapers. Send for estimates. S. C. Forsaith Mach. Co., Manchester, N. H.

Corn Sheller Wanted.

We wish to build the latest and best Corn Sheller in the world on royalty. Send cut and copy of patent with royalty asked immediately. Manufacturer, Lock Box 267, Columbus, Ohio.

The Scroll Saw advertised by A. H. Pomeroy in this issue is a thoroughly practical machine. He agrees to refund the money paid for all machines sold not satisfactory after testing.

Wanted.—Situation, on commission or salary, to sell machinery and mill supplies by a man of nine years' experience. References given. Box 467, Waverley, N. Y.

Blake's Belt Studs. The strongest and best fastening for Rubber and Leather Belts. Greene, Tweed & Co., N.Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

Wanted.—Novelties or patented specialties to manufacture on contract. Burckhardt & Schneider, makers of fine tools, models, and light machinery, 211 and 213 Mulberry Street, Newark, N. J.

Acme Sash Cord (coiled wire). Cheaper; ten times more durable. C. W. Belting Co., 93 Cliff St., New York.

Applegate (burglar) Invisible Electric Matting. 1512 Chestnut, Philadelphia.

"Bookkeeping Simplified." The double-entry system briefly, simply, and practically explained. Nothing like it in print. Sold by booksellers and by Chas. R. Deacon, publisher, 1017 Chestnut St., Philadelphia. Price, $1.00.

Hercules Lacing and Superior Leather Belting made by Page Belting Co., Concord, N. H. See adv. page 270.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. $100 little wonder. A perfect Electro Plating Machine. Sole manufacturers of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty, St., New York.

Grimshaw.—Steam Engine Catechism. A series of thoroughly Practical Questions and Answers arranged so as to give to a Young Engineer just the information required to fit him for properly running an engine. By Robert Grimshaw. 18mo, cloth, $1.00. For sale by Munn & Co., 361 Broadway, N. Y.

The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Coiled Wire Belting takes place of all round belting. Cheap; durable. C. W. Belting Co., 93 Cliff St., N. Y.

Air Compressors, Rock Drills. J. Clayton, 43 Dey st., N.Y.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

Peerless Leather Belting. Best in the world for swift running and electric machines. Arny & Son, Phila.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Shafting, Couplings, Hangers, Pulleys. Edison Shafting Mfg. Co., 36 Goerck St., N.Y. Send for catalogue and prices.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Wanted.—Patented articles or machinery to manufacture and introduce. Lexington Mfg. Co., Lexington, Ky.

For Power & Economy, Alcott's Turbine, Mt. Holly, N.J.

Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Wood Working Machinery. Full line. Williamsport Machine Co., "Limited," 110 W. 3d St., Williamsport, Pa.

Walrus Leather for polishing. A choice invoice English tanned just arrived. Greene, Tweed & Co., N. Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Send for descriptive circular on lubrication. Charles H. Besly & Co., North American Agents for Reisert's Celebrated Solid Oil, 175 & 177 Lake St., Chicago, Ill.

Planing and Matching Machines. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Iron and Steel Wire, Wire Rope, Wire Rope Tramways. Trenton Iron Company, Trenton, N. J.

Bradley's improved Cushioned Helve Hammer. New design. Sizes from 25 to 500 lb. Bradley & Co., Syracuse, N. Y.

Curtis Pressure Regulator and Steam Trap. See p. 222.

Universal and Independent 2 Jaw Chucks for brass work, etc., both box and round body. Cushman Chuck Co., Hartford, Conn.

Crescent Steel Tube Scrapers are made on scientific principles. Crescent Mfg. Co., Cleveland, Ohio.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 286.

Cure for the Deaf.

Peck's Patent Improved Cushioned Ear Drums perfectly restore the hearing and perform the work of the natural drum. Always in position, but invisible to others, and comfortable to wear. All conversations and even whispers heard distinctly. We refer to those using them. Send for illustrated book with testimonials, free. Address F. Hiscox, 853 Broadway, New York. Mention this paper.

Pays well on Small Investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusements. 136 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Providence Steam Engine Co., Providence, R. I., are *sole builders* of the "Improved Greene Engine."

Catechism of the Locomotive, 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N. Y.

"*To Mechanics.*"—When needing Twist Drills, ask for "*Standard*," or send for catalogue to Standard Tool Co., Cleveland, O. See page xi., Export Edition.

Steel name stamps, 15 cts. per letter; steel figures, $1 per set. F. A. Sackmann, 1099 First Ave., Cleveland, O.

Seam and Looping Machines, patent Burr Wheels, Brushing Machines. Tubbs & Humphreys, Cohoes, N. Y.

Machinists' Pattern Letters. Pattern Letters to order. Vanderbugh, Wells & Co., 110 Fulton St., New York.

Astronomical Telescopes, from 6" to largest size. Observatory Domes, all sizes. Warner & Swasey, Cleveland, O.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) B. S. H. asks: 1. What are the ingredients used in flavoring the best smoking tobacco? A. Various flavoring mixtures are made and sold in New York. Cristiani's "Perfumery and Kindred Arts" gives a number of recipes such as the following:

Tincture of cascarilla	6	ounces.
" " tonqua	4	"
" " tolu	2	"
" " orris	2	"
" " valerian	2	"
Oil of nutmegs	½	"
" " cloves	¼	"
" " rhodium	1	drachm.

2. There was a circus here some time since in which a girl walked on a ceiling, apparently of board, in an inverted position. By what means was it accomplished? A. The walking is accomplished by means of electro-magnets. A patent for this purpose has recently been issued, a copy of which we can send to you for 25 cents.

(2) G. W. asks what mercury can be thoroughly dissolved with. A. Nitric acid, even when dilute and in the cold, dissolves it freely.

(3) J. H. L. desires a receipt for frosting silver jewelry. A. Dip the article in a solution of nitric acid and water, half and half, for a few minutes, then wash well in clean water and dry in hot sawdust. When thoroughly dry, brush the sawdust away with a soft brush, and varnish the parts required to be bright.

(4) A. C. asks at what point along the Atlantic coast the Gulf Stream approaches the nearest. A. Cape Hatteras.

(5) L. C. B. writes: Will you please tell me how diastase may be obtained? A. A cold infusion of malt is heated to 158° Fah. (to coagulate its albumen); it is then allowed to cool, and alcohol is added to the filtered liquid, when diastase is precipitated under the form of a tasteless white powder which is freely soluble in water.

(6) J. L. H. writes: I wish to make a propeller 20 inches in diameter. From which could I obtain the most speed—from a 2 horse power engine, one of 3 flukes or one with 2 flukes? The boat is 25 feet over all, 20 feet keel, 3 feet deep, and 5½ beam. A. 3 flukes are generally used, and considered the most efficient.

(7) J. P. K.—The addition of a little oil of cloves will prevent mucilage from souring. Salicylic acid, and sometimes carbolic acid, are similarly used. You will find in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157, numerous recipes for inks.

(8) H. C. F.—For long and short reach vehicles of the same weight, both being under the same conditions on a level road, there could be no perceptible difference in their pull; but on uneven roads the long reach vehicle is easier and less jerky upon the horses. This is very perceptible in drawing long timber on rough roads.

(9) F. W. S. asks whether any one has ever used a continuous screw for propelling boats—a screw 10 feet or 20 feet long. A. The continuous screw was tried in the early experiments with screw propulsion, and found worthless.

(10) P. T. C. asks for a solution to prevent the colors of embroidery on white silk handkerchiefs fading in washing. A. Before washing it is recommended to soak the articles for some time in water, to every gallon of which is added a spoonful of ox gall. Alum added in small quantities to the wash water is also used to prevent fading.

(11) M. C. asks: What is the best preparation used by draughtsmen for whitening boxwood blocks previous to making drawings? (Blocks used by wood engravers.) A. Every draughtsman has his fancy for one or another of the many whites, with varieties of gums. Our artists find good satisfaction in cake flaked white or bottled Chinese white.

(12) G. W. F. asks: Is there any better way to obtain a due east and west course than by turning a right angle from the true north and south as obtained by observing the North Star? If this is sufficient, is the mean of repeated angles with a Buff and Berger transit (4½ inch needle) sufficiently accurate to run such a line sixty miles in length, a boundary between States? A. A due east and west line in your latitude is not a straight line, but rather a great curve in which every part shall be at a right angle with the polar axis, and whose absolute radius shall be the least distance from the given point in latitude to the earth's axis. The curve on the plane of the given latitude should have a radius equal to the distance on that plane extended to meet the polar axis, so that, to run a due east or west boundary for 60 or more miles, offsets for tangential departure from the great circle should be made, and a new meridian established for each section of from 5 to 10 miles. This equation forms one of the difficulties encountered in rearranging boundary surveys that were originally described by compass courses.

(13) E. B. asks: 1. Can a static machine be substituted for a battery of cells for galvanoplasty? A. No. 2. The reason why? A. Because galvanoplastic operations require a current of great quantity with low intensity. The electricity of the static machine has a very high tension, but very little quantity.

(14) H. S. asks: Why do the eyes of a portrait appear to follow a person around the room? A. The surface upon which the features are outlined being flat, no matter at what angle they are observed, we see the same flat delineation, the lines always bearing the same relation to each other.

(15) R. J. P. writes: I would like you to answer in your columns a few questions in regard to the dynamo described in SUPPLEMENT, No. 161. 1. Will it answer to have the magnet and armature cast from the same iron, if it is soft, as used in a machine shop, or would it be better to have the magnet cast, and to make the armature of soft wrought iron? A. Both magnet and armature may be made of soft cast iron. 2. Are Nos. 14 and 16 wire the best, where machine is to be used for plating, and run by power? A. These numbers are correct, but coarser wire may be used if desirable. 3. How fast should it run to get the best results? A. From 1,500 to 2,000 revolutions per minute. 4. Could the machine be used to run a small light, if wound with coarse wire? How many gallons of solution will it operate, or how much nickel will it deposit in an hour? A. Yes, if the lamp has a very low resistance. The questions regarding the solution must be settled by trial.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

F. R. S.—The specimen of clay sent is useful for the manufacture of the commoner grades of earthenware. It brings $1.35 a ton at Amboy and $1.50 at New York. We would suggest your sending samples to the potteries at Liverpool, Ohio.—G. W. S.—The mineral is an arsenical iron ore, known mineralogically as mispickle. It is of no commercial value, as arsenic is only smelted as a by-product.

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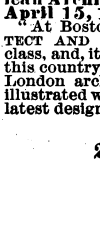
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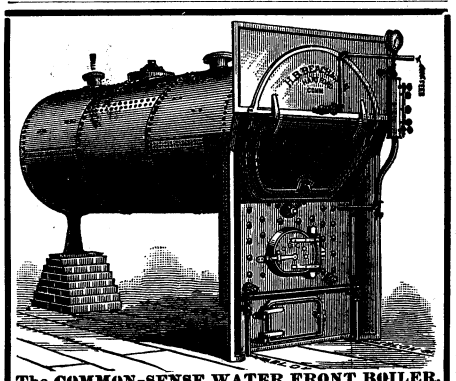
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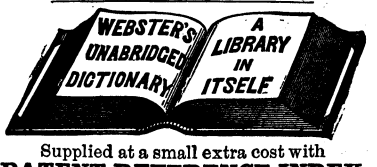

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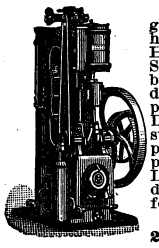
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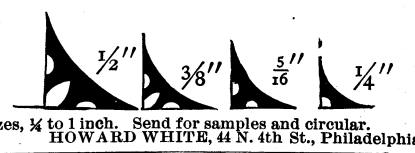

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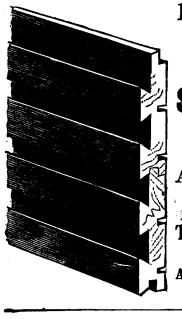
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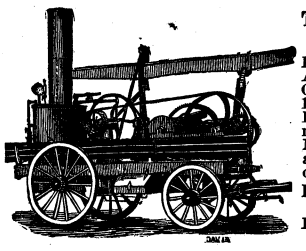
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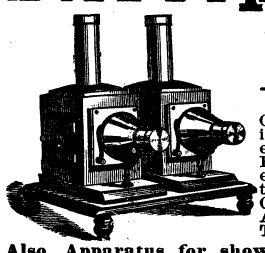

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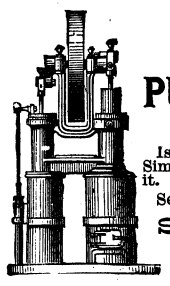

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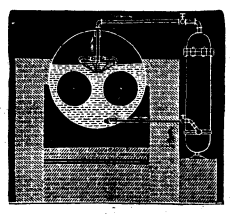

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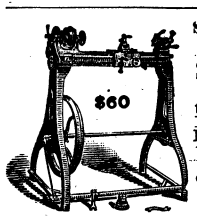

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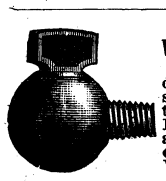

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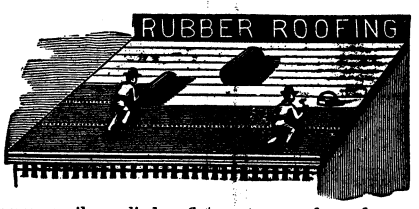

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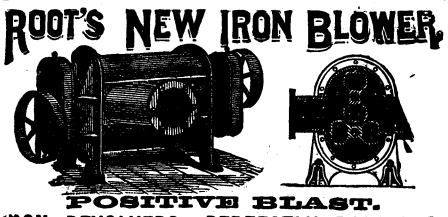

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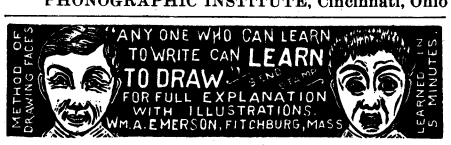
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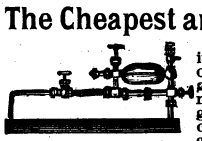

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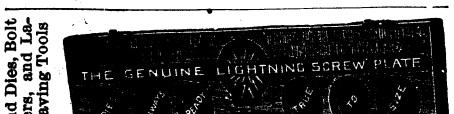

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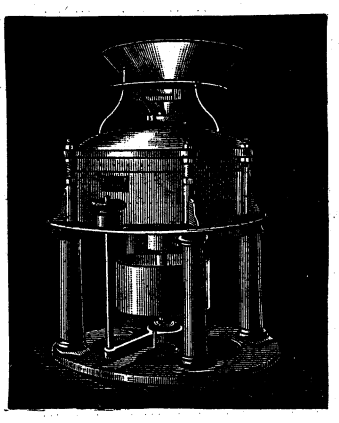

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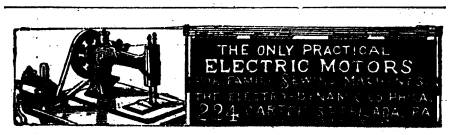

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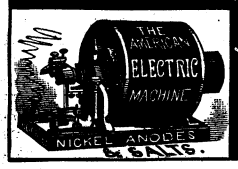

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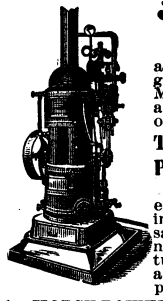

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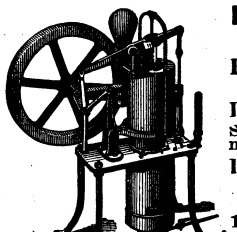

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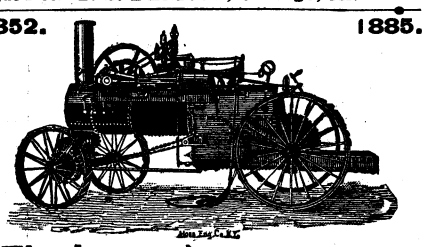

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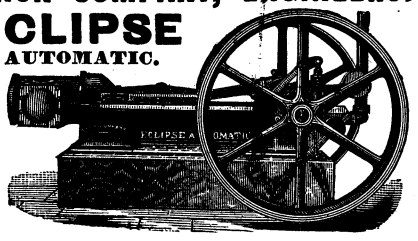

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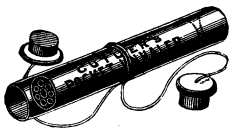

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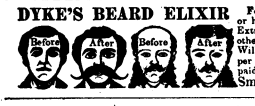

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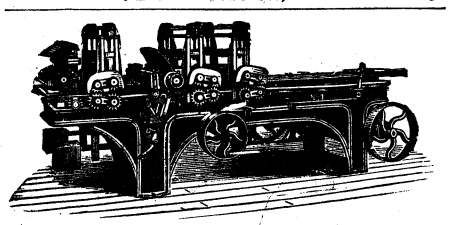

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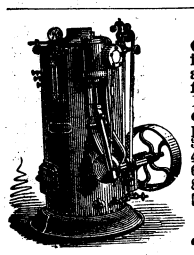

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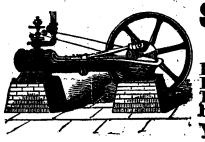

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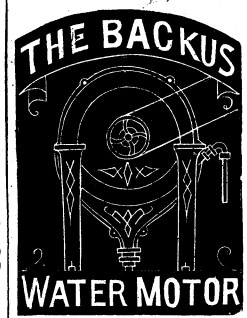

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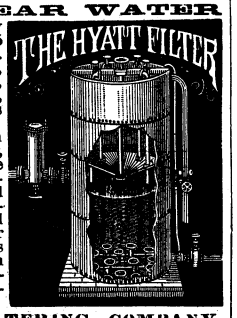

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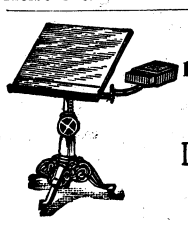

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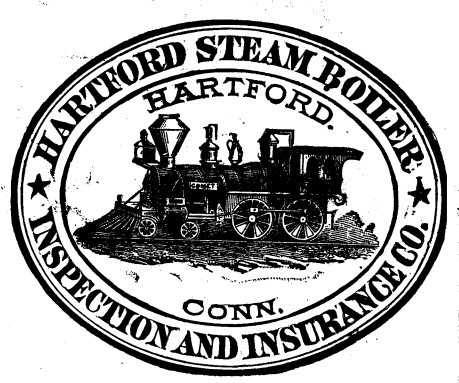

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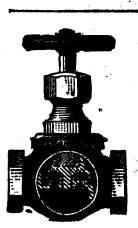

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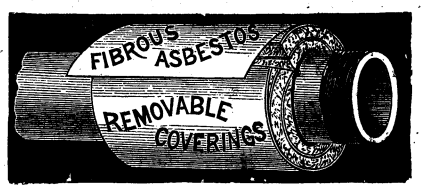

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